THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

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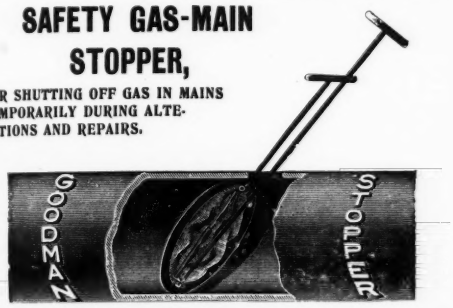

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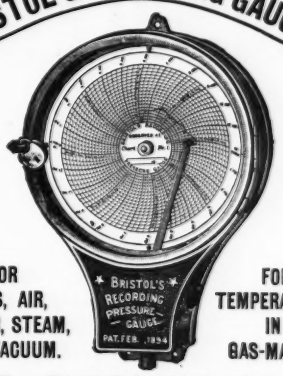

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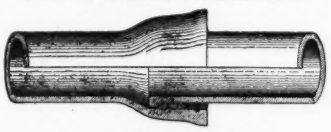

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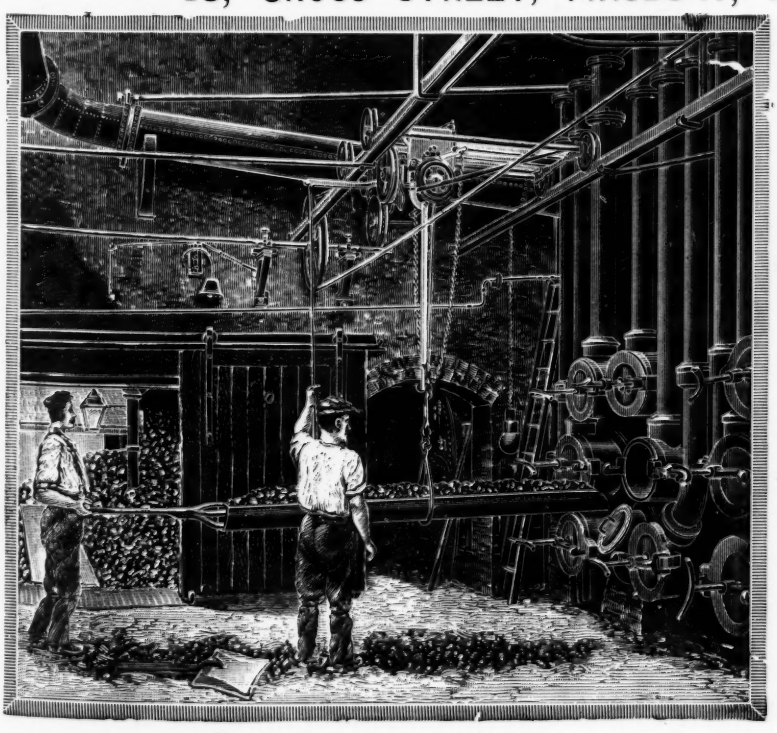

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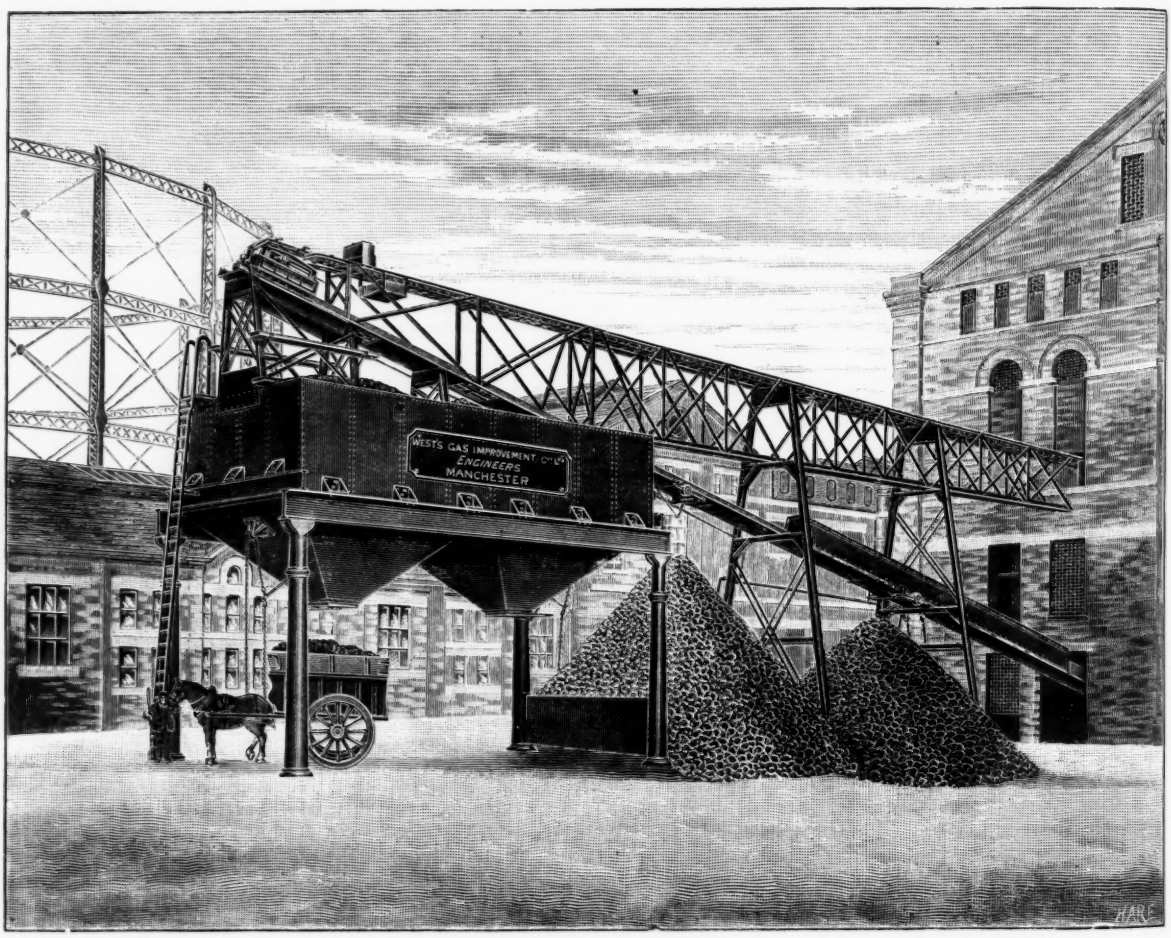

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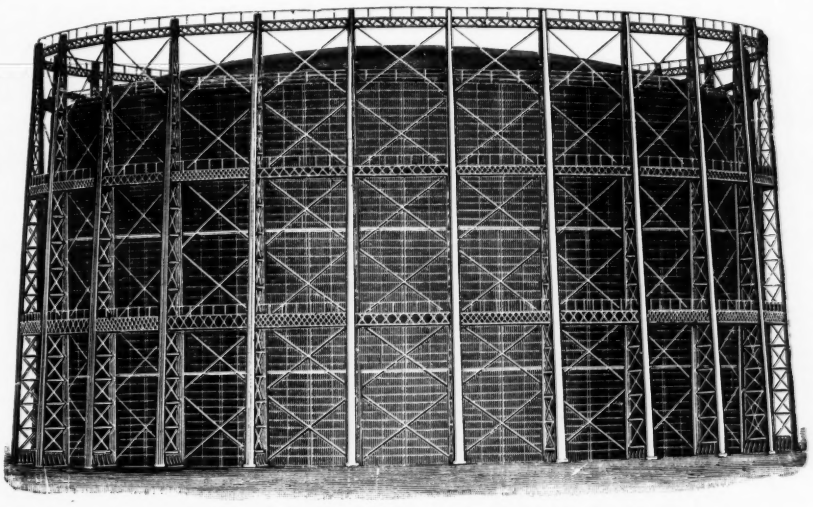

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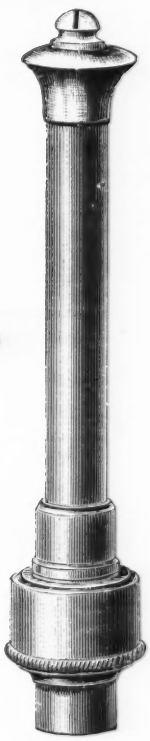

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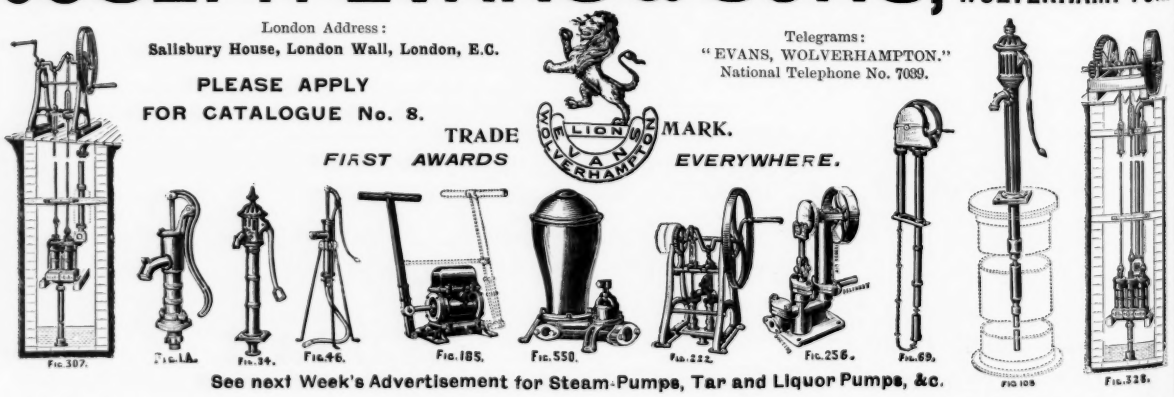

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Berlin V. (Schmargendorf)	20	180	Mannheim	6	54
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Bockenheim, near Frankfort	29	261	Muehlhausen i. Th.	4	36
Bremen	30	270	Mailand (Milan)	24	216
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Chemnitz	27	243	Odense	9	72
Coblenz	13	117	Randers	4	36
Darmstadt	12	108	Remscheid	3	27
Danzig	20	180	Rostock	6	54
Dresden II.	14	126	Rixdorf	12	108
Dresden III.	10	90	Stettin	21	189
Drontheim	2	18	Stockholm	24	216
Düsseldorf	8	72	Strandvej	4	36
Esslingen	3	27	Triest	18	162
Elberfeld	5	45	Winterthur	8	72
Frederiksberg	27	233	Witten	4	36
Flensburg	6	54	Wittkowitz	4	31
Gera	9	81	Wien (Vienna)	186	1671
Genf	7	63	Zürich	32	288
Göttingen	10	90	Berlin-Tegel	40	360
E. & J. Gutmann, Wien	2	6	Nürnberg	32	288
Haag (The Hague)	9	81	Plymouth	8	72
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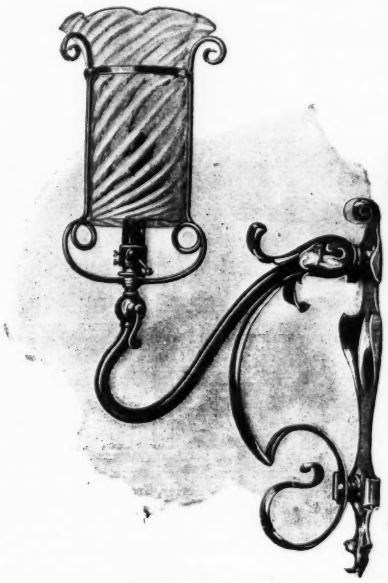

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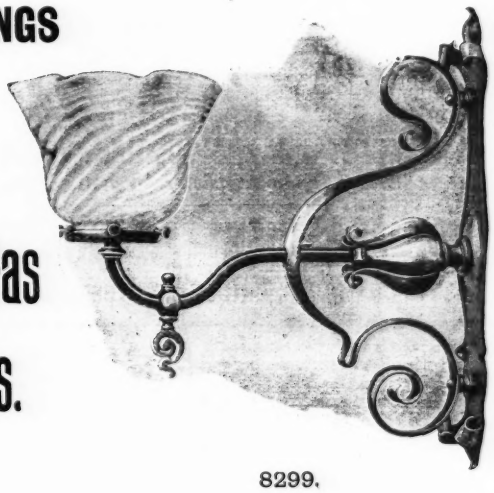

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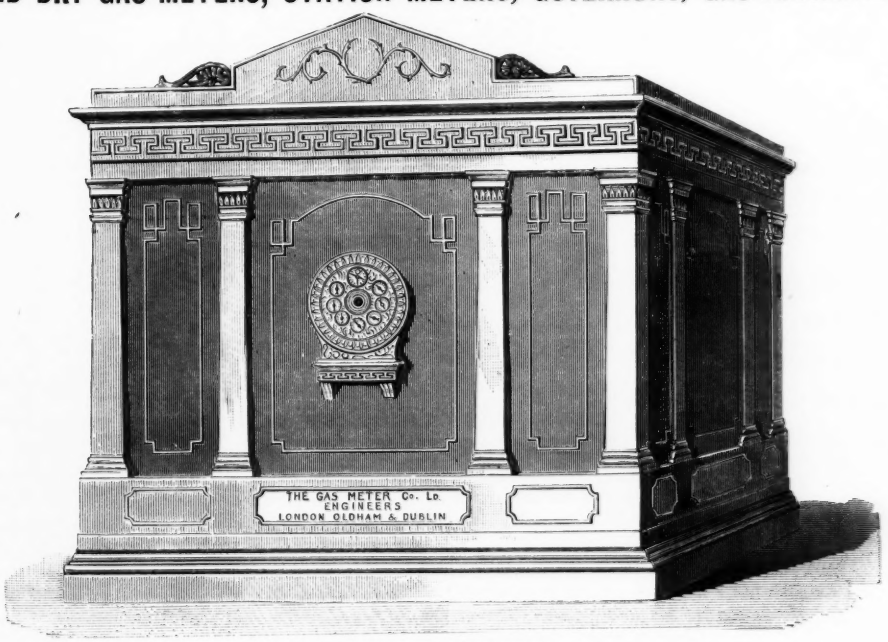

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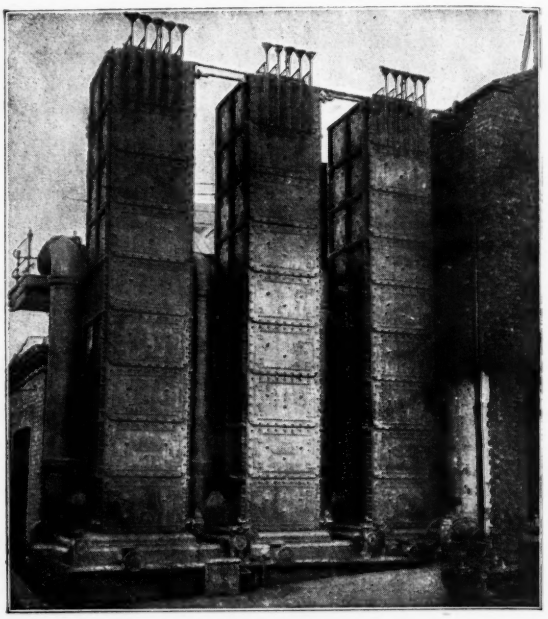

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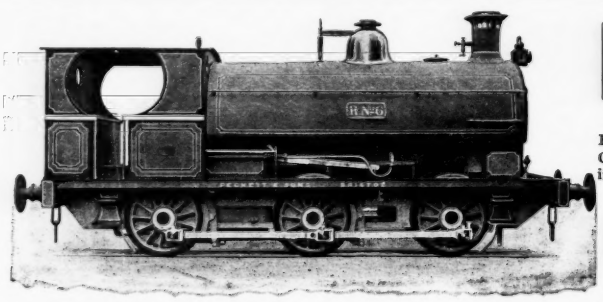

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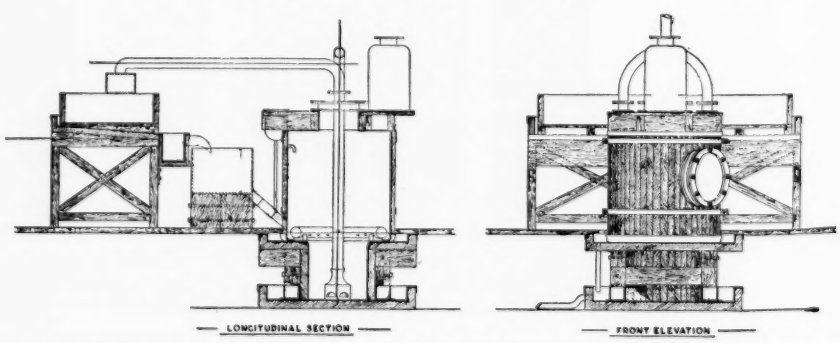

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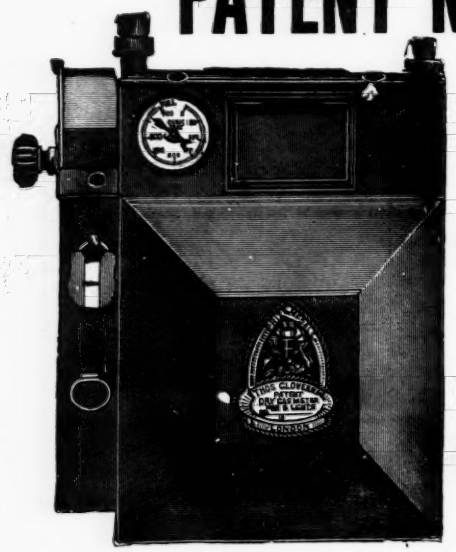

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EDITORIAL NOTES.

The Meeting of the Gaslight and Coke Company.

IT is a long time since there was so pleasant a meeting of the proprietors of the Gaslight and Coke Company as that of Friday, which was not marred by the sound of a single discordant note. The assembled proprietors seemed to be only too thankful that the long struggle of the Directors against public opinion, as represented by Parliament, was over for the time being, and that the Company had come out of the unequal strife with so little real injury. The Governor—Sir W. T. Makins, Bart.—had more than the customary and formal meed of praise, in his personal and representative capacities, for the part played by the Board in turning over the new leaf of the history of the undertaking; for nobody asked a hostile question, nor hinted dissatisfaction with a word of the official message. "All's well" was the motto of the day—felt rather than expressed. This fact, having regard to the momentous character of the occasion, is very remarkable. For if one pauses to consider for a moment what was the nature of the account which the Board had to render of their stewardship for the immediate but irrevocable past, it covered matters serious enough. In the first place, the Company have a new Act of Parliament; but it has been paid for by a knocking-down of the standard price such as, only a short time ago, would have been resisted as tantamount to an outrage on the British Constitution. Over and over again, it has been contended that any alteration of the standard price would be a breach of the covenant on which purchasers of sliding-scale gas stock pay their money. The alteration has now been effected; and yet the credit of those who consented to the sacrifice has remained untarnished. All the London Gas Companies have now gone the same way; and the market valuation of their respective stocks has not even given a passing tremor in consequence. The lesson of this event may not be what Mr. C. E. Jones declared to the meeting—that the standard price of gas under the sliding-scale is not a material consideration to a company; but it certainly bears the interpretation that it is not of such cardinal importance to the investor as it was at one time held to be. The belief was not unwarranted; and it served its purpose for the proper period. But for the presumptive fixity of the initial price, we should have had each gas settlement reopened at every opportunity. This danger has been overpassed; and there can now be no objection to the revision in a reasonable spirit, when the occasion serves.

The feeling of the proprietors at the meeting undoubtedly was that a brighter future lies before the Company. The greed of dividends, which was the curse of the past quarter of a century, has been effectually checked. Whatever yet remains to be done to bring the works and plant of the undertaking up to the highest standard of efficiency, will be effected. So much is to be gathered from the really self-denying utterances of the Governor on Friday, which were markedly chastened from the tone of former days, when nobody in authority seemed to care how much the capital was being piled up, so long as a fat dividend was forthcoming. In face of this reformation, the confession that the sales of gas had again fallen off for the half year made no impression. All this may yet be recovered, if the concern is only worked on business lines.

High and worthy regard was paid by the Governor to the momentous personal changes which synchronize with the new settlement of the Company's statutory obligations. The retirement of Mr. John W. Field was spoken of in adequate, but restrained, terms. It is not necessary to add to the appreciation we have already expressed in regard to Mr. Field's character and devotion to the Company. All that was proper in respect to the sweeping reorganization of the superior staff in every department was duly said by the Governor. As by a sudden turn of the wheel of Fate, young men have come to the front at the Horseferry Road, all at once—Mr. Watson, Mr. Goulden, Mr. Rayner, and Mr. Goodenough—a complete headquarters' staff. They have now their opportunity for earning distinction; and, with all sincerity, we wish them the success due to their merits. Years to come will prove the wisdom or otherwise of the administrative decisions announced on Friday last; but the proprietors may rest assured that the Directors have not hastily promoted any man. The only thing the proprietors can do to strengthen the hands of their representatives in administration, is to let it be understood that reasonable liberality in the matter of salaries will not be regarded as an extravagance. The standard of living, and especially of living easily, in London, has measurably risen of late years; and it is of the very first importance that those who have given their life's work to the service of a great Metropolitan undertaking, like that of the Gaslight and Coke Company, should not only be satisfied with their lot, but should enjoy the gratification of feeling themselves at the very top of their respective trees.

The Cause of Efficiency in Manufacture.

GAS engineers, and other mere technicians, are accustomed to behave themselves lowly and reverently before their betters, the professors of Science, and to receive with becoming humility the utterances of these eminent persons respecting the principles which they, the professors, are in the habit of distinguishing as underlying the every-day practices of engineering. It is proverbial that lookers-on see more of the game than the players; and in the rush and struggle to get work done in accordance with the circumstances of the moment and the necessity for turning every shilling to the best advantage, it may well be that the engineer cannot always see what he is doing, so clearly as can the professor who surveys his efforts from the calm elevation of his Chair. It is a part—perhaps the most important part—of the functions of occupants of such Chairs to con the working engineer on his course. This is fully recognized, fortunately, by many good men eminent in Science. Others, unhappily, seem to think it their duty to clap on the brake whenever the engineer wishes to strike out a new line, as to which all they can say is that they do not appreciate the necessity. This is to exceed the proper limits of criticism, and bring the high office of the critic and adviser into disrepute. Science will always be respected in the persons of its professors, so long as it is applied to help, to guide, and to warn endeavour. Lacking it, many a good technician has spent his energies upon a vain thing. Misapplied, many a denunciatory Doctor has found himself playing the undignified part of a scarecrow—neglected and a mere laughing-stock beside the roaring stream of material progress.

Professor Thurston, of Cornell University, has a reputation for helpfulness to the practical worker, which he has recently justified by pointing out the two controlling conditions which determine the commercial value of the results of the engineer's labours after increased efficiency. They are always present, and their resultant varies as one or the other is in the ascendant. They are these: "Increasing "costs with increasing efficiencies;" and "advancing ex- "penditure with diminishing gain." The language is somewhat ponderous; but the meaning is that there is a limit to the commercial value of any increased efficiency or economy of output which costs money. It is no news, being indeed a truism of industrial economics; but nevertheless it is quite well worth restating. For it is astonishing, sometimes, how some accomplished engineers allow themselves to be carried away by an excessive regard for efficiency, to the ignoring of countervailing costs which make it not worth having at the price. Especially when the very modern engineer happens also to be a "new broom," he is apt to allow his zeal for attractive efficiency to outrun his discretion. The opportunity becomes a temptation. Professor Thurston remarks: "With the crude apparatus "of the earlier stages of uneconomical and incomplete

"industrial systems, there usually exist great opportunities "for improvement by refinement of the apparatus and by "systematizing the industry at (often necessarily) increased "cost in the form of invested capital." This is the improving engineer's opportunity. Where it becomes his temptation, is after the first necessities of the case have been met; when every further improvement, which entails additional expense, can only secure a diminishing advantage. Ultimately, unless the process of modernization is arrested on the safe side of the limit—which not every clever man can perceive—more is paid for a given gain than it is worth; and the net cost of the improved system will exceed that of a less perfected arrangement. It might almost be said that the cleverer and more ardent the engineering reformer, the more likely he is to go too far in his pursuit of efficiency.

At least, this criticism of too-clever works engineering appears to have been justified by recent experience in Germany, where the establishments that were hardest hit in the industrial crisis were the best equipped and most advanced in technic. The only works which contrived to keep solvent throughout the pinch were the old-fashioned shops with few and light standing charges and small and inexpensive staffs. This is a fact which it will be well to bear in mind, when the idea of Charlottenburgs is being so much advertised. The very highest technical efficiency is not necessarily the most profitable way of working. A comparatively cheap plant that can be laid off without wasting much, may be preferable to a gorgeous affair which must be kept going at full blast lest it should eat its head off. There is apt to be a terrible difference between the economy of a plant or an engine run for a test under special conditions, and the average working results over a term of years. A machine which performs wonders of production may not come out too well in the end, if selected material and picked labour are required to make it go. All these considerations, like many others which the manufacturer in business has to make his account with, are questions for wisdom, not cleverness, to answer. There is no Chair of Wisdom, Pure or Applied, in any of our Universities; yet the ordinary man may possess a sufficiency of it for his needs.

An "Accident" under the Workmen's Compensation Act.

It is rarely, after so considerable a lapse of time since it came into operation, that one has to discuss a legal decision under the Workmen's Compensation Act; but an appeal was disposed of last week by the House of Lords which it is impossible to pass over without appreciative notice. This was a case in which a workman, by somewhat recklessly overtaxing his strength in the course of his ordinary occupation, had injured himself internally, for which he sought compensation. The legal difficulty in the case was the absence of the "fortuitous element," as Lord Macnaghten called it, from the circumstances. There was no external accident occurring in the course of the man's employment. Consequently, the County Court Judge who heard the case in the first instance held that it did not come within the scope of the Act; and accordingly he refused the man compensation. The Court of Appeal affirmed this decision, which may therefore safely be taken for sound law, so far as the letter went. But the House of Lords, with their traditional scorn of the letter, gave a very much wider scope to the word "accident." Lord Macnaghten said that the workman had injured himself suddenly and unexpectedly by throwing all his might and all his strength and energy into his work by doing his very best and utmost for his employer, not sparing himself nor taking any thought of what might come on him. In reward, he was told that the injury he brought upon himself by so doing was outside the Act. Their Lordships did not think this could be right. If such were indeed the correct interpretation of the law, it would be a bad thing for both the employers and employed. Such a decision would play into the idle hands of shirkers, who would always have it before them as an excuse for not risking their health by over-exertion—not a peculiarly necessary piece of caution!

The judgment of the House of Lords is be commended to the particular study of those works managers, and others, who may at any time be at a loss to decide what is legally chargeable as an "accident." This is one of those good old English words, like "advertisement," which have suffered a change of meaning in the popular vocabulary. As commonly used, such words are always understood in their newest and most specialized significance. Insensibly, even educated and scholarly people drop into the same habit of parlance, until it comes with quite a shock to them to be reminded that words which bear a current meaning have also a constitutional value, of which they cannot be deprived by mere change of fashion in talking. It is not for us to define the full meaning of the word "accident;" but there is very much more in it than would be suspected by young persons whose course of study did not include "Trench."

Meanwhile, it is worth noticing how completely the disingenuous clamour against the Workmen's Compensation Act, on the score of its asserted defect of encouraging litigation, has died away. We always believed in the Act, and said so, when it was more fashionable to shake the head over its apparent loosenesses of expression. It did, of course, throw a good deal of work upon the judicial benches, high and low, for the time, and until the meaning of the free language used in the drafting was tested by cases in point. But the Judges were equal to the task; and the Act, and the cases which elucidate it, stand to-day as a monument of justice and mercy for which a parallel would be hard to find.

The Extravagance of Local Government Bodies.

If there is one matter of domestic politics that more than any other interests and affects the people of the United Kingdom, it is the general, rapid, and formidable increase of the expense of local government. Everybody feels it, most people complain of it, nobody seems to know what to do about it. During the last weeks, when the proceedings of the general meetings of the English Railway Companies have bulked largely in the newspapers, and many minds have been preoccupied with the great question of how the country stands financially, this ever-present cause of solicitude with those who have to find the money for local authorities to spend, has cropped up on all sides. It was mentioned with befitting emphasis by the Governor of the Gaslight and Coke Company at Friday's meeting. The tale told on these occasions is always the same. Local rates have everywhere risen during the last ten years by at least one-third of their present figure, and in many places they have been doubled. Nor is there yet any apparent finality about the process, which, on the contrary, seems likely to repeat the phenomenon of the rolling snowball. And all these joint-stock companies, with one consent, point out that they are powerless to influence this contemporary movement. A stoker, or a pointsman, may exercise the privilege of the municipal suffrage; but not the great undertaking which finds him his means of livelihood, and contributes the greater part of the municipal revenues. It may be a coincidence, but it is certainly the fact, that this accelerated growth of local government expenditure has synchronized with the appearance and rise in domestic politics of what is called Progressivism, with the contemporary enlargement of municipal trading enterprise. It is easier to recognize this new feature of local political life than to define it. As Lord Rosebery said of something else, it is a dividing line which lies diagonally across the old party divisions, and is all the more difficult to descant upon in the light of ordinary political principles. Consequently, the average citizen does not know where he is when the glittering baits of Progressivism are dangled before his eyes by men of different political parties, all anxious to pose as "model" custodians of district interests and pattern administrators of local affairs.

Advocates of municipal trading are always prepared to demonstrate that their proceedings result in saving local expenses—if not actually in the form of rates, then in the various facilities and services provided for the public with assistance from the rates. Usually the demonstration refers to some place other than the locality immediately concerned; but this is only a detail. Unfortunately, the influence of Progressivism is not confined to actual instances of trading with the aid of the rates; for some of the most extravagant examples of Municipalism are not referable to the mania for trading, properly so called. Consequently, there is no highly rated local government area of which the authorities cannot point to some other district for justification. The matter is now, however, fast coming to a head. Ratepayers are growing tired of the municipal game of hiding the pea of extravagance under the other thimble; and a popular sentiment in

favour of reforming the whole thing is growing and will have to be reckoned with. Those who believe in the principle of government by elective bodies, on a democratic basis, will have to brace themselves to deal with the extravagance of money, and the not infrequent inefficiency, of these popularly-elected administrations. Democratic institutions were given a free hand by the popular feeling of the last century. It is high time to take stock of the practical result of the experiments in government inaugurated under this phase of public opinion.

This is not the place for a general survey of the working of elective governments throughout the world; but it is hardly necessary to point out how sadly the results have fallen short of the ardent expectations of the philosophers of the early Victorian epoch. Everywhere the enormous cost of national defence, the legislature, police, the administration of justice, popular education—everything, in short, which stands for modern government—is producing the natural reactions of Anarchism and Socialism. Everywhere the people who pay the expenses of these things are asking themselves, with more or less bitterness, whether they are worth what they cost. This is precisely what the British public is beginning to inquire, with its habitual common sense, with respect to the new fashion in Municipalism. Our local authorities have abused the confidence reposed in them. Parliament is awakening to the headway which the spendthrift spirit has already made in these highly respectable bodies, and the first warning has now been sounded. Parliament, however, is too amenable, in the ordinary way, to illegitimate pressure exerted through "our member," to act drastically enough in respect to municipal arrogance, without an unmistakable backing from the nation at large. The nation looks to Parliament for guidance in this, as in other matters; and happily there exists in the public mind implicit faith in the integrity of British statesmen, so that they do not often lack the support they ask for when they agree upon a line of policy.

Two most important declarations of parliamentary views of points of modern Municipalism have been published, in the special report of the Police and Sanitary Committee of the House of Commons, and the report of the Joint Committee on Municipal Trading, respectively. The former contains several pertinent observations on municipal ways, and in particular recommends that the attention of the Law Officers of the Crown should be directed to the manner in which local authorities at present exercise their borrowing powers. Moreover, the Committee observe that they "frequently have occasion to doubt whether the extent of the "financial burdens consequent upon the powers sought by "Bills" of local authorities had been sufficiently brought home to the ratepayers. They rejected one such Bill on this ground. This statement leads up to the report of the Committee on Municipal Trading, which is of an interim character, and is confined to the point of municipal bookkeeping. The principal portions of the document are given elsewhere; and it is enough to say here that the report is a thoroughly sensible presentment, with the substance of which few will be found to disagree. The future results of the inquiry will be looked for with heightened interest.

Welsbach Capital Reduction in Court.

The few shareholders of the Welsbach Company who have consistently—though we hold foolishly—done their best to obstruct and destroy the capital reduction scheme and the re-establishment of the concern on a sound financial basis have gained just as much by carrying their unreasonable antagonism (which was incited more by avarice than by any sense of justice to fellow participators in loss, and recognition of what is necessary in the best interests of the Company) into Court as most people imagined they would. And that is nothing, excepting their costs, which a generous Judge—as is Mr. Justice Buckley—awarded them for the "assistance" they rendered to the Court by placing their views before him. This was a piece of liberality which was hardly merited, seeing that his Lordship was against the opposition on both their points, and in no particular can it be found that they supplied the Court with a single fact that was not presented or suggested by the petitioners themselves. But perhaps the "assistance" that Mr. Justice Buckley refers to is that the case submitted by the opposing parties was of service to him in settling in his mind the equity of the scheme, to the formulation of which he recognized that much time, patience, and thought had been devoted. However, the point as to the costs is a small one; and, in view of the complete accord of the Court with the scheme, the Directors will not experience any disturbance of equanimity by their payment. The opponents hung their case on two points—First, they challenged the fact that a loss had been sustained by the Company to justify the enormous reduction of capital involved; and, secondly, even if the Company had sustained the loss, the scheme was unfair. How any sane person, in the face of the plethora of fact to the contrary, could have advanced the first contention is a matter entirely beyond comprehension. In every respect, his Lordship upheld the petitioners' case—indeed, he went further, and expressed his own opinion that the framers of the scheme had taken a too rosy view of the value of the goodwill, having gone a long way beyond the customary practice in assessing its value. On all other points, too, he failed to find where the petitioners for reduction had taken a too pessimistic prospect of the Company's position. The second contention as to unfairness showed the dog-in-the-manger spirit that animated the chief opponents to the scheme. They are preference shareholders; and, like the famous Jew, they wanted their full pound of flesh. However, in effect his Lordship held—as all but this small minority of shareholders have held before—that the scheme is one which regards fully and fairly the interests of all parties, and is one which will benefit the concern and all associated with it. We congratulate the Directors, the Advisory Committee, and the large body of consenting shareholders on their success in this application to the Court for its sanction to the scheme.

Contented Shareholders.

Following the good example set by the Chartered Company earlier in the day, the proceedings at last Friday's meeting of the Brentford Gas Company were of a very quiet and pleasant character. Not a ripple disturbed the contented calm of those who were present. This says a good deal in favour of the work of the Board; for though the attendance of shareholders at the meetings is not usually large, those present always include some prominent men in the profession, who would not be slow to perceive any weak points. The Chairman (Mr. H. C. Ward) found, however, nothing but progress to report; and so his listeners had a very enjoyable time. In one respect the Brentford Company have been more fortunate than some others, for they have experienced a respectable increase of close upon 5 per cent. in the consumption of gas during the past half year as compared with the first six months of 1902. This has not been the case with every gas undertaking. Another good point is that the Company are intending to still further strengthen their position by taking advantage of the power they possess to create an insurance fund for the purpose of meeting losses arising from extraordinary occurrences. This fund, together with the substantial sum standing to the credit of the reserve fund, should form a comforting item in future statements of accounts issued by the Company.

A Lesson from Abroad.

Last April, when noticing the annual report of the Shanghai Gas Company, we took occasion to compliment the officials on the excellent results obtained. Now the Engineer of the Company (Mr. H. King Hiller), in an article which is published in another part of to-day's issue, is good enough to explain, for the benefit of his professional brethren, "how it is done." And very simple the recipe is—"persistent advertising and canvassing, with generous treatment of consumers. That the consumers are treated generously is quite clear from the fact that the price of gas for ordinary purposes is no more than $1·70 (= 2s. 8¾d.), with a still cheaper rate for power users. But this does not exhaust the inducements to burn gas held out by the Company; for a system has been introduced by which Chinese shops and dwelling-houses are piped free, without the accompaniment of prepayment meters. Interior tubing is provided on loan, and no charge is made for the service-pipe or for meter-rent. The consumer, however, has to find his own burners and globes; and the number of "points" fitted must exceed three. By means of merely fixing the piping on the face of walls and ceilings, it is rendered easy to remove, if

necessary, for use elsewhere. The conditions under which these loan installations are fitted up are simple, and no more than are absolutely necessary to safeguard the Company's property. The consumer undertakes to exercise reasonable care to prevent damage; and the Company reserve to themselves the right to remove the fittings and meter at any moment, though they state that this would only be done in case of non-payment of accounts due or of wilful damage to the fittings. It is also stipulated that any alteration or addition required must be done by the Company's fitters, no outside fitters being allowed to do the work; and a deposit as security for the care of the fittings and payment of gas accounts is required. In case of removal, of course, the Company must be notified at once, failing which the consumer in whose name the meter stands is held responsible for any gas used or loss of, or damage to, the fittings. One other point to which we should like to draw attention is the plan adopted by the Company for encouraging the use of gas-engines for the purpose of generating electricity. This consists in providing the capital needed to instal gas-driven dynamos; the Company recouping themselves out of the difference between the cost of generating the current and the price per unit which the consumer pays them. It is found, in this way, that after about five years the whole of the capital outlay is repaid; and then the plant is handed over, free of charge, to the consumer. This must make the Municipal Electricity Department feel decidedly uncomfortable—especially as the Gas Company always arrange their charge for current at such a figure as to undersell them. Mr. King Hiller's article contains other "wrinkles"—such as the encouragement of canvassing by the staff in their spare time—but we must refer readers to his communication for these, as well as for the figures which prove how popular have these arrangements for increasing the sale of gas become.

A Warning to Corporation Officials.

Without in any way entering into a discussion of the merits of the fight which was waged last week in the Leeds City Council over a proposal to raise the salary of an official, we may draw attention to one respect at least in which the unfortunate affair should act as a warning to other corporation servants. It appears that the gentleman in question was appointed early last year to the position of General Manager of the Leeds tramways system, at a commencing salary of £900 a year, to be increased if his services were found satisfactory to £1000 at the end of two years. Shortly after his appointment, Birmingham were in some difficulty about their tramways; and the Leeds Committee agreed to lend them the services of their Manager. The report he drew up created such a favourable impression, that later on Birmingham made him a definite offer of £1500 per annum if he would go and manage their trams for them. Only one week was allowed for a definite reply; and therefore there was no chance of getting the opinion of all the members of the Leeds City Council before the answer was forwarded. The Manager consulted the Chairman of his Committee, and told him that if Leeds would offer him similar terms he would prefer to stay there. He even went so far as to intimate that he would consent to a substantial sacrifice for a time, if he were sure the Birmingham offer would ultimately be reached. The Leeds Tramways Committee, after considering all the circumstances, decided, by a majority of two to one, to offer the Manager £1200 a year as from the 1st ult., and three further annual rises of £100 to £1500—the first of such instalments to accrue as from April 1 next—with a minimum engagement of five years. In view of this, the Chairman of the Committee felt justified in assuring the Manager that there was a reasonable prospect of the offer being confirmed by the Council. The Manager, on his part, taking this assurance in all good faith, accepted the proposal, and declined the offer of the Birmingham Corporation. Birmingham thereupon promptly secured the services of the Manager of the London County Council Tramways; and so the Leeds Manager lost his opportunity. He has since also lost the rise in salary which the Leeds Committee offered him; for the City Council—no doubt largely owing to the violent opposition on the part of the ratepayers which the proposal evoked—have declined to adopt their own Committee's suggestion. Apart altogether from the fact of whether or not his present salary is adequate for the work he does at Leeds, this resolution of the Council constitutes a very great hardship on the Manager; and our purpose in referring to the matter is to prevent others who may at some time have a similar offer of greatly increased remuneration elsewhere from refusing it simply and solely on the faith of their Committee's assurance that they will not suffer by so doing. As already remarked, we do not intend to discuss the merits of the step taken by the Leeds City Council, though the temptation to do so is strong. This bare recital of the facts should, however, be quite sufficient to accomplish the object in view.

The Ventilation of Workshops.

Among the duties apportioned to Medical Officers of Health under the Factory and Workshop Act of 1901, is the supervision of the ventilation of the places referred to; and the report for the year 1902 of Dr. Dudfield to the Metropolitan Borough of Paddington contains some interesting remarks upon this head. Under the Act, the Home Secretary has the power to prescribe the standard of impurity to be permitted in workshops; and a Departmental Committee (whose conclusions were fully noticed in the "JOURNAL" at the time) was appointed by him to report on the subject. The standards which they recommended were, during daylight or after dark when only electric light is employed, 12 volumes of carbonic acid in 10,000 volumes of air, and when gas or oil is used for lighting 20 volumes. These standards Dr. Dudfield hopes will not be adopted, as he considers the proportion of carbonic acid named is too high, and constitutes a retrograde proposal as regards certain factories. He also thinks it anomalous that in an electrically lighted workshop the occupier should be limited to 12 volumes, while in a gas-lighted shop the standard may be, at the same time, 20 volumes. It appears from the report that a good many cases were discovered by the Inspectors in which gas fumes were not properly removed; and Dr. Dudfield remarks that in several workshops gas-stoves for heating smoothing irons or for warming the rooms were found unprovided with any means of carrying off the products of combustion. There appears to be a very general impression, he says, that there is no need to make any such provision; but this is, of course, a great mistake. He has found very little difficulty in securing the proper ventilation of stoves for irons by hoods connected with flues, and other means; but it is not always so easy to deal with appliances provided for warming, with the result that workers in such places are specially prone to drowsiness, headache, and enæmia. "Many advertisements," adds Dr. Dudfield, "relating to such stoves definitely state that special ventilation is not required. The erroneous nature of such statements is apparent to anyone giving the matter the slightest consideration." Naturally this portion of the report has been seized upon by a portion of the Press, and published under some such attractive title as "The Dangers of Gas-Stoves." If one could be sure that such a sensational headline would frighten no one but those owners of workshops to whom Dr. Dudfield refers, only good would result; but, unfortunately, the chances are that many people may be scared who would not think of using an unventilated gas-stove for warming a closed room.

WATER AFFAIRS.

Colliery Workings under Reservoirs.

THERE have been few better instances of the proverbial uncertainty of the law than that furnished by the case decided by the House of Lords on Thursday last, as reported in our "Legal Intelligence." It arose out of arbitration proceedings instituted to determine the amount of compensation to be paid to a Colliery Company for the minerals they were called upon to leave in the ground in order not to endanger the foundations of a water reservoir. The amount in dispute was not great—the difference between £2950 and £5650; but the principle involved was most important. The facts are very simple. In accordance with section 22 of the Water-Works Clauses Act, 1847, the Bwllfa and Merthyr Dare Steam Colliery Company gave notice to the Pontypridd Water Company of their intention to work a certain seam of coal lying under, or immediately adjacent to, their

reservoir; and this brought from the latter Company, on Oct. 15, 1898, a notice to treat. The parties went to arbitration; but, owing to delays, the proceedings were not concluded till Feb. 1, 1901. The award was made on the 26th of April following—not in the usual way, but in the form of a special case stated for the Divisional Court. The Umpire had encountered a difficulty, which he was unable to overcome, from the fact that, subsequent to the date of the notice to treat, coal rose considerably in value; and the point upon which he wished to have a legal opinion was, briefly, whether he should or should not take this circumstance into consideration. The answer of the Court, consisting of Justices Ridley and Phillimore, was that he should, and that the Colliery Company were entitled to the higher amount specified. This judgment was appealed against, and reversed by Lords Justices Vaughan Williams, Romer, and Mathew, whose decision has now been overruled by the unanimous vote of the House of Lords.

During the arbitration proceedings, it was stated in evidence by the witnesses for the Colliery Company that, at the time when the rise in price came, they were in a position to make forward contracts for the delivery of the whole of the coal within the area protected by the notice to treat, and consequently would have been enabled to secure the full benefit of the turn of the market. The Water Company, on the other hand, urged that this evidence should be rejected altogether, and that the award should be based solely upon facts and circumstances known at the date of the notice, and such inferences as to the course of future events as experts in the matter could then have properly drawn. The latter was the view taken by the Court of Appeal, who evidently regarded the notice in the light of a contract for the purchase or transfer of certain property at its then value. Mr. Justice Phillimore and his learned colleague, however, did not look upon the matter in this light. The former laid it down that the inquiry was not to ascertain the value of the coal, but "what the Colliery Company, if they had not been prohi-"bited, would have made out of it during the time it would "have taken them to have got it." This *dictum* was quoted approvingly by the Lord Chancellor and Lord Robertson in the course of their judgments; both expressing the opinion that the opposite view rested upon the false analogy of a notice to treat given in the case of a sale of land. Lord Macnaghten was very emphatic on this point. He said the notice from the Water Company not only did not operate to make a contract or to transfer property, it was "not even a "step towards a contract or a step towards expropriation." No property was acquired; it simply remained where it was. The mineowner was prohibited from working certain seams; and those who were the cause of this were bound to make him full compensation, in ascertaining the amount of which it was the duty of the Umpire to "avail himself of all infor-"mation at hand at the time of making his award."

The Water Company have unfortunately failed in their appeal; but their action has had the effect of bringing into clearer light the exact nature of the transaction contemplated by the 22nd and other sections of the Act of 1847 to which particular reference was made in the course of the proceedings, and therefore they have performed a public service in eliciting the opinion of the highest tribunal in the country upon the point raised. It has now been laid down, in the clearest possible manner, that these sections do not contain any provision, or even any suggestion, that a line is to be drawn at the date of the counter-notice, and that all that occurs after that date is to be regarded simply as if it had never happened.

Filtration v. Protection.

It cannot be said that the time occupied by Professor Delépine at the meeting of the British Association of Water-Works Engineers was very profitably spent. He wrote rather discursively in making a comparison as to which system possesses the greater merits in delivering to the consumer pure water—protection of the sources of supply (mainly gathering-grounds) or filtration. But although the Professor worked up a long case to belittle filtration and to laud protection, he told the members nothing that to them was new; and the whole of his composition and argument suffers from the fact that he has obviously constructed both on experiences and data of the past which have brought about the high degree of efficiency in filtration and consequent purity of town water which we enjoy to-day. If the Professor would take the experiences of recent years and revise his paper and opinions in their light, there would, we imagine, be very little left of the former; and the latter might, if he is not too prepossessed by his old views, be in accord with our own, which are (if we were bound to a choice between filtration and protection) in favour of thorough filtration before water is delivered to the consumers, leaving protection to be practised in every case so far as circumstances will permit. That is not the Professor's view. In his last sentence, he says: "Whenever expendi-"ture makes it a matter of necessity to choose between "filtration and protection, I have no hesitation in saying "that protection is better than filtration."

We have carefully examined the paper for some real and reasonable ground for this opinion, and have failed to find any that accords with modern practical experience. As already suggested, the explanation of this final conclusion is that the author is not up to date in his knowledge of the subject on which he treats. The facts, the figures, and the regrettable epidemics of some years ago, which he adduces in proof of the inefficiency of filtration in eliminating deleterious organisms and matter, are the very things that produced the increased knowledge on the method and practice of filtration which has given us, during the past few years, a splendid immunity from those epidemics and diseases which have their origin in impure water. This being so, we are not by any means disposed to do as Professor Delépine has done—put that which has been proved effectual in a second place, and give to that which, while both admirable and (if circumstances allow) advisable, has not been proved so thoroughly, the first and preferential place. There is no experience to justify anyone saying that protection of gathering-grounds and sources of supply will afford the same assurance of purity as the well-conducted filter-bed. Between the gathering-ground and the consumer's tap, the distance is great; and no matter how large and comprehensive are the measures for protection, they cannot possibly be carried out with such rigidity as will ensure the same protection as sand filters which are under the constant, personal supervision of men trained in the work. In these beds, there is concentrated more protection for the consumer than can be obtained by any permissible and carefully devised system of inspection, regulations, and threats of penalties.

At the same time, Professor Delépine does not deprecate the practice of filtration; he only places it in an inferior position to protection on what we hold are false premisses. But protection as advocated by the Professor is of such an extreme character that it is not surprising the practical water-works engineers who heard his paper were disposed to treat the concluding suggestions rather lightly as being, from their intimate knowledge, altogether beyond the necessities of their own conditions, and expensive to a really prohibitive degree. The Professor is much too general in his asseverations, particularly on this point of expense. He declares that, while omitting all working figures and illustrations, "on the whole, sand filtration requires too much supervision "and expenditure to be considered a perfect method of deal-"ing with impure waters;" and again "efficient filtration "involves a considerable initial and permanent expense." As to what his protective suggestions would involve in this matter of expense, he is silent; but practical men have only to consider them individually and then together to see that, from the cost point of view, the comparison would favour by far the side of filtration. It is no use showing to-day the worst side of things under conditions which were not so well understood as they are to-day. Show the worst and the best that exist to-day under an improved state of knowledge, and then it will be seen that advance has been made; and the line along which that advance has gone is the one to be further pursued. Filtration must not be neglected; and, in addition, protection of gathering-grounds and other sources of supply should be carried to as large an extent as circumstances and the means of a community will allow. That is the view long since advocated in the "Journal;" and water engineers endorse it as being the proper one. It will require greater argument than Professor Delépine adduces to assure water engineers that filtration should be relegated to a subordinate position in their practice.

The "Financial News" says that a rumour is just now current of a pending "deal" in natural gas, financed from Fenchurch Street.

ESSAYS AND REVIEWS.

SHOULD GAS COMPANIES AND CORPORATIONS VEND "PRODUCER" GAS?

THE passing this session of the Bill for a Mond gas supply in bulk within an extensive area comprising the Potteries district of North Staffordshire, with the counties of Derby, Denbigh, and Flint, is an important event for the older gas industry of this country. Regarded as a movement supplementary to the South Staffordshire Mond Gas Act, it must be considered as proving that Parliament is kindly disposed towards the promoters of all well-reputed schemes for cheapening the supply of mechanical power for the needs of the national industries. Broadly speaking, the lesson of this experimental legislation is that Parliament is more favourably inclined towards the enterprise of those who declare their belief in the existence of room for a new gas industry, of the nature of that upon which the two measures in question are based, than to the views of those who have represented that the existing gas industry is adequate to meet all the demands which a distributed gaseous fuel is economically competent to satisfy.

Pursuing this line of reflection, it may further be concluded that, in accepting the former proposition, Parliament has been greatly influenced by the evidence given, to the effect that the new gas industry, if and when created and established with the necessary statutory protection, will not in any respect injure the old, even where they occupy the same ground. On the contrary, as we interpret this sign of the times, the idea appears to be rather that a whiff of competition, even on independent but parallel lines, may do the old gas interest good by bracing up the proprietors, whether private or municipal, to fresh efforts in the conduct of their business. That such an effect may be produced by the Mond Gas Companies, as they get to work, is more than likely. Indeed, it may almost be taken for granted that this will be the case, inasmuch as there is no gas company or gas-supplying municipality in a Mond gas district but has already seriously considered what policy to adopt in the eventuality of the new supply being actually brought into their preserves. At present these alarmed interests are waiting on the event. They have recovered from the thunderclap of outside competition, from which in any form they had imagined themselves completely protected; and they are watching intently every movement of the newcomer. This attitude is that of prudence. At the same time, it ought to have some positive justification, which it is the purpose of this essay to furnish—at any rate, as food for reflection.

The question that faces an ordinary gas undertaking in a Mond gas country is, firstly, whether to stick to the old technic—possibly modifying the conditions of the sale department—or to go in for a fuel and power-gas branch of the same character as the new scheme. Most undertakings of the kind are prevented by the terms of their Acts from entering upon any such business as the manufacture and distribution for sale of non-illuminating gas. Usually, their standard of illuminating power alone is an absolute bar to their embarking in a business of this kind, besides which, it is matter of common agreement that a dual distribution system of the ordinary character would be impracticable, even if there were a chance of its proving profitable to work. The former disability might be removed by application to Parliament; but nobody believes for a moment that a paying business could anywhere be done in the way of a general, compulsory, domestic distribution of weak producer gas, apart from the numerous and grave objections to it on grounds of public security. There is nothing new in such a suggestion, which has, on the contrary, been before the world more or less ever since the invention of Joshua Kidd, in 1875, who was the first to make semi-water gas by a continuous process.

The commercial experiment was made many times in the United States, with the result that none of the companies engaged in it ever earned a dollar of profit; and all the ventures have disappeared. There was no general demand for such a gas; and the industrial and commercial facts of the business were summed up by Mr. F. H. Shelton as follows: "The gas may cost a little less to make, but it costs as much to distribute; and the works, mains, services, meters, &c., must be larger than is necessary to deliver an equal supply of heat in the same time by illuminating gas. The investment per million sold becomes excessive." It is true that in a certain few parts of the United States a business is carried on in "natural gas," which is non-luminous. This natural product, however, is really a petroleum gas, and twice as concentrated a fuel as ordinary illuminating gas; so that the objection of larger pipes, &c., does not apply. Wherever it has a sale, moreover, it is now used as much for illuminating purposes, by means of incandescent burners, as it is for fuel or power. Indeed, but for the use to which natural gas is put for lighting, it would hardly pay to sell for domestic fuel, as the demands on this account of ordinary households are insufficient; and the gas cannot be sold at all for the purpose, except on the basis of comparative cost with coal. Natural gas is essentially a natural "freak," and is nowhere seriously relied upon. It is of importance to note that wherever it is given up, on account of the failure of the wells, the companies invariably supersede it with ordinary illuminating gas, not with producer gas. In Indianapolis this summer, so many as 5000 consumers of natural gas piped from the oil-fields of the State were cut off, and offered ordinary lighting gas instead, at from three to four times the price per 1000 cubic feet. It is reported that, as usual in these circumstances, about a third of the custom was retained by the Company under the new conditions. It is expected that within a year all the consumers, with few and insignificant exceptions, will be recovered. This experience is not singular.

So far as the ordinary run of domestic or town's business is concerned, therefore, the experience of the past quarter-of-a-century holds good; and the manufacture and distribution, for all retail purposes, of common illuminating gas keeps the field. Clearly, the cheaper and better suited for general use the gas is made and sent out, and the more liberal the terms on which the trade is carried on, the better for all parties. The question, therefore, as to whether statutory undertakers of gas supply would be well advised to contemplate any radical change of their business, to remove the differences of kind between common town's gas and Mond gas, must be answered in the negative. The further question arises, however, as to whether a gas company or a local authority, not being under any statutory limitation as to the kind of gas they can deal in, and possessing all the necessary advantages for making and distributing any description of gas which might be demanded for a special purpose, or for consumption in bulk, as a fuel or source of motive power, should now embark upon the same sort of enterprise to which the Mond gas companies are committed. It might be proper for them to start a branch business of this class, for the public benefit, if they could be assured of the existence of a demand for the gas, and could see their way to deal in it without incurring a loss. It would be childish to pretend that corporations so enterprising as (say) those of Manchester and Stockport—who can make and sell any sort of gas they choose—would not provide the local industries with gaseous fuel as quickly as the necessary arrangements could be made, if their technical advisers could see their way to recommending the policy. The only obstacles in the way of such an interesting development are lack of proof of the existence of a want, and doubt if, assuming the existence of a market for the commodity at a price, it could be safely supplied at a reasonable profit. These are the obstacles which the Mond Gas Companies are formed and authorized to remove by their successful working; and the whole of the technical world will wish them well through the double trial. It is not at all in a spirit of hostility to a highly interesting experiment that most gas engineers adopt an attitude of extreme reserve in regard to the Mond Gas Companies. There would be a certain amount of excuse for their disliking the Mond gas propaganda, in its pretension that the new adventurers know better what to do with a ton of coal than they do, which is by way of being a slur upon the older practice. But we do not believe that there is any such feeling towards the Mond gas schemes on the part of those gas engineers who have been most active in opposing them. On the contrary, several acknowledged leaders of the gas engineering profession have almost gone out of their way to say smooth things of the Mond gas prospectors.

Only—no gas engineer would put a penny of his own money into one of these schemes for the distribution and sale of "producer" gas, nor advise a consultee to do so. Speaking for the gas industry generally, we can simply aver that we await conversion by the evidence of accomplished facts, to faith in any other gas industry but the one by which we live. We do not believe in the commercial future of any simple producer gas distribution scheme, large or small, anywhere, or for any purpose of a general scope. This is sweeping enough, in all conscience. One reason for incredulity is that the thing has never been done. Against this, it is now claimed that Mond gas, and Mond gas only, can do it. Let it be proved by the only valid argument—experimental success—which still lies in the future, and we will be the first to admit the evidence. Nobody outside the charmed circle of its proprietary knows either what Mond gas is, or what it is capable of in distribution. All this remains to be ascertained.

What really is known, is all against the presumption that Mond gas contains within itself the possibility of succeeding in becoming the staple of a business which has never been created for any other description of "producer" gas since the days of Siemens and of Kidd. Of the merits of Mond gas, *quâ* producer gas, for immediate local consumption, there need be no question here; it is one among many. Suffice it to say that, unless the ammonia-recovering feature of the process is practised to special advantage, the device is on the same level with other proprietary producers, of which there are scores in the market. It is not even the only ammonia-recovering gasifier dealt in by the Power Gas Corporation. And now we have, within the last few days, Mr. William Young stating, in his paper read before the North British Association of Gas Managers,* that the *rationale* of ammonia-recovery is not as it is presumed to be in connection with the working of Mond gas-producers!

Be this as it may—and the point has great technical value, which it would take too long to go into here—it is only necessary to bear in mind that the idea of relying upon the recovery of ammonia to recoup the prime cost of the coal gasified, covers an

* *Ante*, p. 298.

economic fallacy. Either the profitable recovery of ammonia is possible from every description of coal otherwise suitable for gasification in a producer, or it is not. If the element of selection is once admitted, so that certain classes of the raw material are preferable to others, then this superiority will have to be paid for. The owner of the coal supply will want his share of the profit of working it; and it will not be his fault if the portion is a small one. In the long run, it will be as much as can be expected if the value of the ammonia recovered more than pays for the cost of getting it, *plus* the extra charge for the suitable coal.

(To be continued.)

THE AUDIT OF MUNICIPAL ACCOUNTS.

THE Joint Committee of the two Houses of Parliament appointed some weeks since to "consider and report as to the principles which should govern powers given by Bills and Provisional Orders to municipal and other local authorities for industrial enterprise within or without the area of their jurisdiction," presented their report towards the close of the past month, and it was issued last Wednesday. The Committee was composed of the Earl of Crewe and Lords Aberdare, Barnard, Brougham and Vaux, Lamington, Rothschild, and Zouch, Sir George Bartley, Sir John Stirling-Maxwell, Sir James Woodhouse, and Messrs. Fenwick, Platt-Higgins, and Powell-Williams. The Earl of Crewe was appointed Chairman. The Committee regarded their appointment as a continuation of the inquiry held in the year 1900; but inasmuch as they could not hold their first meeting till the 15th of June, they felt it would be impossible to issue a report on the whole subject. They therefore decided to devote their attention to one or more distinct aspects of the question—leaving others till Parliament should be pleased to direct further inquiry.

The branch of the subject with which the Committee decided to deal was that of municipal accounts, with regard alike to the form in which they are prepared, the systems of audit, and the right of access to them possessed by ratepayers. The evidence heard was directed mainly to these questions. They consider that, whatever view may be taken of the proper limits, if any, which can be set to municipal trading, it is important that, wherever it exists, "ratepayers should be not less fully and continuously informed of the success or failure of each undertaking than if they were shareholders in an ordinary trading company." They acknowledge that in a large number of cases this is done. But they find that there is in some instances evidence to quite the contrary effect; and, in view of the ever-increasing number and magnitude of municipal undertakings, they think it is most desirable that "a high and uniform standard of account-keeping should prevail throughout the country." They are doubtful whether it would be possible to prescribe a standard form of keeping accounts for all municipal or other local authorities, having regard to the varying conditions existing in different districts. But they recommend that the Local Government Departments should invite the Institute of Chartered Accountants, the Incorporated Society of Accountants and Auditors, and the Institute of Municipal Treasurers and Accountants of England and Wales, the Society of Accountants in Edinburgh, and the Scottish Institute of Accountants in Glasgow, to confer and report upon the matter.

The Committee directed special attention to the question of audit; and they recommend that a uniform system should be applied to what they call the major local authorities—viz., the councils of counties, cities, towns, burghs, and of urban districts. At present, municipal corporations in England and Wales, with a few exceptions, are only subject, as regards audit, to the provisions of the Municipal Corporations Act, 1882, by which one Auditor, who must be a member of the Town Council, is nominated by the Mayor, and two, who cannot be members of the Town Council, are elected by the ratepayers. The evidence taken by the Committee showed that no effective system of audit is thus supplied. The Elective Auditors are poorly paid, or are unpaid altogether; little interest is taken in their election; and although in some cases they are able to point to a particular irregularity, it is not clear that they could not make the same discovery in the capacity of active ratepayers. No complete or continuous audit is ever attempted by them. All County Councils, the London Borough Councils, and Urban District Councils are subject to the Local Government Board audit, which is carried out by District Auditors, who, as a rule, are not accountants, and are not, in the opinion of the Committee, properly qualified to discharge the duties which should devolve upon them. To apply the Board's system of audit to municipal corporations would, the Committee think, arouse strenuous opposition from them. But, in addition to this, the fact that District Auditors are not accountants, seems to unfit them, as a class, for the continuous and complicated task of auditing the accounts of what are really great commercial businesses. The Committee accordingly recommend—

(*a*) That the existing systems of audit applicable to Corporations, County Councils, and Urban District Councils in England and Wales, be abolished.

(*b*) Auditors, being members of the Institute of Chartered Accountants or of the Incorporated Society of Accountants and Auditors, should be appointed by the three classes of local authorities just mentioned.

(*c*) In every case the appointment should be subject to the approval of the Local Government Board, after hearing any objections made by ratepayers; and the auditor, who should hold office for a term not exceeding five years, should be eligible for reappointment, and should not be dismissed by the local authority without the sanction of the Board.

(*d*) In the event of any disagreement between the local authority and the auditor as to his remuneration, the Local Government Board should have power to determine the matter.

(*e*) The Scottish practice of appointing auditors from a distance, in preference to local men, to audit the accounts of small burghs, should in similar cases be adopted in England.

The Committee are of opinion that it should be made perfectly clear by statute or regulation that the duties of those who are entrusted with the audit of local accounts "are not confined to mere certification of figures." They accordingly further recommended that the auditor should have the right of access to all such papers, books, accounts, vouchers, sanctions for loans, and so forth, as are needed for his examination and certificate. He should also be entitled to require from officers of the authority such information and explanation as may be necessary for the performance of his duties. He should certify as follows:—

(1) That he has found the accounts in order, or otherwise, as the case may be; (2) that separate accounts of all trading undertakings have been kept, and that every charge which each ought to bear has been duly debited; (3) that in his opinion the accounts issued present a true and correct view of the transactions and results of trading, if any, for the period under investigation; and (4) that due provision has been made out of revenue for the repayment of loans, that all items of receipts and expenditure and all known liabilities have been brought into account, and that the value of all assets has in all cases been fairly stated.

The Committee consider that the auditor should be called upon to express an opinion upon the necessity of reserve funds, of amounts set aside to meet depreciation and obsolescence of plant in addition to the statutory sinking funds, and of the adequacy of such amounts. He should also be required to present to the local authority a report which should include observations upon any matters as to which he has not been satisfied, or which in his judgment called for special notice, particularly with regard to the value of any assets taken into account. The local authority should forward to the Local Government Board both the detailed accounts and the report of the auditor upon them; and a printed copy of the accounts and report should be supplied by the local authority to any ratepayer at a reasonable charge.

In view of the thoroughness of the proposed audit, the Committee are of opinion that powers of surcharge and disallowance could be altogether dispensed with in the case of the major local authorities. These powers could not, it is believed, be applied to municipal corporations, in view of the strong objection expressed by them; and it is doubted whether their retention in the case of other authorities would compensate for the loss of uniformity which would result. The Committee consider that the power of disallowance, applying as it does only to illegal expenditure, and not to unwise undertakings and enterprises, does not afford any real safeguard to the ratepayers whose interests are affected. With a continuous, vigilant, and thoroughly efficient system of inspection and audit, they think the surest guarantee to the ratepayers against extravagance is to be found in "the deterrent effect of public exposure," and the existing legal remedies.

The dispensing power possessed by the Local Government Board under the Local Authorities (Expenses) Act, 1887, throws on the Department an amount of work often out of proportion to the importance of the issue involved. The Committee therefore suggest that, in view of the large changes recommended by them, it might be advisable to create a new body, in the form of a Board of Commissioners of Local Audit, in some respects analogous to the Railway Commission. The body could, they suggest, be entrusted with the powers which the Committee recommend in their report should be vested in the Local Government Board. If, in the case of Scotland, it is thought desirable that the existing statutory audit of accounts of County and Borough Councils should be maintained, the Committee consider that, at any rate, the system of audit for the five large cities which is at present regulated by Private Acts, should be assimilated to that which is recommended for the major local authorities in England.

The Committee conclude their report by expressing the opinion that it would be advisable to continue in a future session investigation into other branches of the subject of municipal trading.

The Fiscal Question and Gas-Works Plant.—At a recent meeting of the Exeter Chamber of Commerce, at which a resolution was passed in favour of an inquiry into our present fiscal system, Mr. H. A. Willey spoke of the effects of what he characterized as the "effete system" which handicapped trade. He said there was lying, for the first time, in his yard at Exeter material for gas-works imported in a manufactured condition from Belgium at 20 per cent. less than it could possibly be produced for here. He contended that the incidence of taxation tended to strangle the industries of the country. In this matter, as a man of honour, he should tell his workmen that he expected them to follow his lead in such a vital matter as this, affecting as it did the very existence of his industry; and he had very little fear of the result. But if they did not follow his lead, then they could not complain if they found their occupation gone, and if he asked them to make room for men upon whose allegiance and loyalty he could depend.

ELECTRIC LIGHTING MEMORANDA.

Mr. Chamen on Electric Lamps—The Need for Economy in Lighting—The Uses of the Nernst Lamp—The Drawbacks of the Flaming Arc Lamps.

At the recent meeting of Municipalized Electricians, the only paper presented which dealt technically with actual electric lighting was contributed by Mr. W. A. Chamen, of Glasgow, who performed the useful service of reviewing all that has been and that appears likely to be accomplished by invention, in the matter of economizing the consumption of electric energy for the production of light. It has been stated in this column more than once that what has passed for progress in electric engineering of late years, has not been directly to the advantage of the users of electric lamps. We have even made bold to maintain that the difference between the course of invention in regard to gas lighting and electric lighting, can fairly be distinguished by the critical application of this rule; for whereas during the past decade the consumer of gas for lighting has had placed well within his reach, in every sense, a means of obtaining tenfold the quantity of light for the same consumption of an even lower-priced gas than he could get before this period, the consumer of electricity for the same purpose is distinctly worse off as regards the lamps he can ordinarily use. How heavily this consideration weighs upon the electric lighting interest constantly appears by the persistent way in which those who have electric light to sell ignore improved gas-burners in their business circulars. They will base all their comparisons with gas upon the performance of the most inefficient burners, and even underrate that for their own purpose. So that those gas engineers who are disposed to make too much of the supposed necessity of catering for the unprogressive users of flat-flame burners are playing into the hands of their trade rivals, who ask for no better encouragement than to be told that this method of using gas for lighting still remains the ruling consideration for the gas industry.

Knowing what we do, however, of the severity of the competition of cheap and brilliant incandescent gas-light with the usual electric lamps, it is peculiarly interesting to follow Mr. Chamen through his criticism of the various descriptions of the latter appliances. To begin with, it is due to Mr. Chamen to acknowledge that he expressed sound views on the interest of suppliers of electricity in the reduction of the amount of energy required to produce a given quantity of light. He freely maintained that economy of current will not have the effect of reducing the revenue of undertakers of the supply, but will increase it, owing to the larger number of consumers who will adopt electric light, and its more generous use by existing consumers. The same observation, of course, applies to the sale of gas. But though the truth appears so obvious, it is a painful reflection on the general intelligence and knowledge of economic principles possessed by some highly-placed administrators of every kind of supply service, that they do not always see it and act accordingly. Passing on to consider the ordinary incandescent lamp with carbon filament, Mr. Chamen asked himself whether there is any probability of its being worked successfully at any materially higher efficiency than the $3\frac{1}{2}$ to $4\frac{1}{2}$ watts per candle power to which we are accustomed. It is a satisfaction to have this confession on record, seeing how many times we have struggled with our electrical contemporaries for precisely this rating of the ordinary electric lamps in service.

Mr. Chamen answers himself in the negative. All he can comfort himself with in this connection is the result of recent tests in Glasgow of some 8-candle power 250-volt lamps, which showed that the degree of efficiency in question is not confined to lamps of 16-candle power or over. This is as it may be. Tests are one thing, and service is apt to be another. Anyhow, the performances of 8-candle lamps are not interesting to gas consumers who can get 20-candle power light for a consumption of 1 cubic foot of gas an hour. Turning to substitutes for the inefficient but workable carbon filament incandescent lamp, Mr. Chamen says he has heard nothing more of the Crawford-Voelker carbide filament lamp brought out a year ago. As regards the Nernst lamp, which is now fairly well known, Mr. Chamen sees the possibility of a saving of 50 per cent. with these, light for light, including the cost of renewals. Unfortunately, the smallest Nernst lamp made for 250 volts is of 32-candle power, which is too large a unit for ordinary house-work, besides which there is the disadvantage of the lamp taking half-a-minute to light up after it is switched on. He thinks, however, that for perfection of lighting in a large room a 1-ampere (128-candle power) Nernst lamp fixed near the ceiling, with a nearly opaque shade beneath it, so that nearly all the light is reflected off the ceiling, is "hard to beat." Let us consider this claim a little. The ceiling must be a whitened one, of course, and the lamp very close to it, which is certainly an awkward limitation of this method of lighting. It is admittedly an excellent way of lighting a large interior, where the necessary structural features exist; but they are not universal. This is the reason why such a plan of lighting is so rarely seen, although its advantages have been recognized for many years. Where there is no white ceiling it is impracticable, except with the adventitious aid of huge reflectors only admissible in factories. Besides, while one is about it, why not use a still cheaper source of light—the electric arc—if the lighting can be done by ceiling reflection?

This difficulty of the comparatively large units in which the Nernst lamp must be employed if at all, largely neutralizes its economy of current. Although it may only consume about half the energy taken by an ordinary carbon filament incandescent lamp, if the user has to put up a 32-candle Nernst lamp where he would otherwise be satisfied with a 16-candle ordinary lamp, there is no saving in it. Consequently, as Mr. Chamen admits, it will not commend itself to the ordinary user of electric lighting for domestic purposes, who is in the majority. It may make its market for shop lighting, for which it will displace only those monstrous carbon filament lamps of high power which have achieved some vogue for the purpose of advertisement. Even including the particular application advocated by Mr. Chamen, this is not all that was expected of the Nernst lamp when it was introduced with so much trumpeting. Mr. Chamen is not without hopes that some combination of radiants, such as those which do so well in the incandescent gas-mantle, may yet be made to produce incandescent electric light of high efficiency. He recognizes that many inventors have been working in this direction, but, oddly enough, did not mention Auer von Welsbach and his osmium lamp. Possibly he meant to include this appliance in the number of new lamps which have a paper existence, but could not be obtained to experiment with. There remains the Cooper-Hewitt mercury vapour lamp; but this undoubtedly clever invention does not seem to have got out of leading-strings. As regards the large and important class of electric arc lamps, which have lately appealed for public favour in the new guise of the "flaming" type, Mr. Chamen has nothing very hopeful to say. The efficiency of the lamp is doubled; but the consumption of carbon is very much greater than with the ordinary type of lamp—thus necessitating trimming at more frequent intervals. The light is not steady, but has a continual quiver, which may or may not be admired. "All that has been brought about is the doubling of the light without altering the consumption of energy; and this is hardly what is required in ordinary street lighting." It is Mr. Chamen's opinion that the light given by an ordinary open arc of 10 amperes is enough for any class of street lighting; and in this he is in agreement with the majority of his professional brethren.

AMERICAN GAS "ARC" LAMPS.

In the "Journal" for the 16th of June, there was a letter from a correspondent who complained of the absence from the London show-rooms of a "small, neat, high-power gas-lamp suitable for outside shop lighting at a moderate price," and expressed a desire to be informed of any that might be in existence. In response to this request, we have received from Mr. Victor Rettich, of the Kern Incandescent Gas-Light Company of New York, an illustrated article in "Light"—"A Journal devoted to the Gas, Hydrocarbon, Acetylene, &c., and Incandescent Light Industries," published in that city—on the better-known gas-lamps of what are generally called the "arc" type sold in America; and we give a few extracts therefrom which may be of interest to other readers than the one who originally directed attention to the subject.

After some remarks on electric arc and incandescent lamps, the author comes to incandescent gas-lamps, the first one described being of German origin, and designed to imitate the Brush electric lamp. He next mentions the "Arthur" lamp, which is made in many designs both for indoor and outdoor use. It is a globe lamp surmounted by an opal glass reflector, having above it another of an inverted saucer shape. The "Century" lamp is also made in several styles. The globe is fastened both at the top and the base, so that in the event of breakage there is less danger of the pieces falling. The makers claim that with four burners they can obtain a light of 900 candles, with a consumption of 17 cubic feet of gas per hour. The burner which gives this result is one of the long bunsen type. The pilot-lights are a unique feature of this lamp, being made of fire-clay, and having in the top two small holes directed towards the mantles, so that the two tubes provide a flash for each, supplied from a point which cannot clog up from corrosion. The "Ball Check" is an oblong lamp which has a self-lighting arrangement consisting of a pendant chain, the first pull of which will light the burners, the second put them out, and the third re-light them. The burners are regulated by the "ball check" bunsen, by which the gas is split up, and enabled to carry more air to the burner-head than is the case with a single-jet orifice.

An attractive, yet strong and serviceable, lamp is the "Cluster," which has been constructed so as to be as nearly as possible proof against the effects of a storm. The mantles are suspended from a heavy ring, fixed on the gas-stem. The "Doorenbos" lamp is neat in design, with a smaller globe than is usual with this style of lamp. The gas is supplied from the side—an arrangement which, it is claimed, prevents carbonization of the mantles. The "Humphrey" lamp, of neat, compact, and effective design, is reported to give a light of 425 candles, with a consumption of 15 cubic feet of gas. The "Eagle" lamp possesses many devices for facilitating cleaning, renewing mantles, and lighting. There is always a tiny jet burning in a protecting harp at the level of the bottom of the mantles, in the vicinity of which are four small pilot-tubes proper. On turning a key at the bottom,

a double stream of gas issues from the top of each tube—one jet in a horizontal direction to reach the pilot-light, and the other vertically to light the mantle. Both the streams starting close together at the tips of the tubes, enable the vertical flame to be lighted from the horizontal one. The "Gray" lamp is noteworthy for the heat-dissipating device fastened over the globe. A deflecting plate splits the upward rush of hot air, and prevents an accumulation of small particles of dirt, &c., settling upon the ceiling. For the "Lovett" lamp—a globe lamp with a large perforated chimney—the moderate claim is made of 400-candle power with a consumption of 17 cubic feet of gas. The mantles are suspended from a cast metal ring, provided with brackets to give ample support to the mantle wires. The "Lighthouse" is another "cluster" lamp, which has lately been improved by the addition of a cock which allows of one or more mantles to be illuminated at will. Four burners give the light of 600 candles. The "Rector" is a lamp which strongly resembles the electric arc lamp. Each burner has a glass or mica chimney attached to the lower end of the iron funnel reaching down to the skirt of the mantle. By this device each flame becomes intensified by the draught, and rendered capable of incandescing an extra long mantle quite to the top.

The "Lumo" lamp is made in two forms—one having the stem surrounded by the burners, and the other adopting a harp for the gas supply. A special burner is used, for which the makers claim great efficiency. A four-light cluster, consuming 14½ cubic feet of gas, is stated to give a light equal to 650 candles. The "Detroit" is a handsome lamp, having a white porcelain enamelled steel cylinder relieved by decorative brass work finished in an oxidized colour. The "Arc" lamp of the Kern Company is equipped with four of their new style of burners; and it is claimed that a light of 400-candle power is obtained with a consumption of 18 cubic feet of gas. The "Klemm" lamp is made entirely of heavy gauge copper, is wind and insect proof, and self-lighting. The globe can be lowered and a new mantle fitted without exposing the interior to the full force of the elements. The lamp of the Welsbach Company stands alone in presenting one special feature—the bottom diameter of the globe being greater than the extreme spread of the cluster, so that the reflector and globe may be raised when a new mantle is to be put on. One or four mantles may be used, as desired. The Company guarantee a light equal to 1200 candles with a consumption of 12 to 15 cubic feet of gas per hour at ordinary pressure. The distinctive feature of the "Yotto" lamp is a glass bowl at the bottom, which, being hinged so as to hang down, permits ready manipulation of the regulating needles. The lamp has a large globe and is well ventilated. The vendors give the lighting power, with a consumption of 15 cubic feet of gas per hour, as 500 candles. The "Turner" lamp presents a novel feature in the shape of a hollow disc, at the bottom of the stem, which acts as a gas cushion, and steadily supplies the four burners attached thereto. The mantles depend from four special wire hooks, secured to a ring, movably attached to the stem.

The foregoing are the characteristics of the various lamps now on sale in America. For more specific details with regard to them, with illustrations of the lamps, we must refer our readers to the publication for which Mr. Rettich's article was prepared.

THE GAS AND WATER STOCK MARKET.

(For Stock and Share List, see page 387).

The Stock Exchange reopened on Tuesday after the Bank Holiday with a rather cheerful air, as if determined to put a good face on things; but it did not last out the day. A renewal of the bad tone in the American Market once more sent everything down; and so things continued for two more days. The realization of Consols made the gilt-edged division very flat, and induced a bad tendency all round. But, on Friday, Americans brightened up; and so prices in general improved. Before the close, however, the see-saw set in again, and quotations were lower generally. Some apprehension also was caused by Bulgarian affairs, which added to the unrest produced by Americans. In the Money Market, rates opened easy, but soon began to harden; and the stiffness was kept up to the close. In the Gas Market, the volume of business was fairly well up to what has been the average of late, and the general position was steady. There were hardly any changes in quotations, and, those, too, being very slight in degree. With the exception of two or three favoured issues, which seem to enjoy a measure of popularity which it is not easy to account for, the prices at which all the high-class gas stocks are marked seem to be well below the figures they ought to command on their merits. Why this should be so, it is hard to say; but, in point of fact, the Gas Market has been very dead for the greater part of this year. Last week, Gaslight ordinary seems to have been most in favour; and the full exposition of affairs by the Governor at the meeting on Friday was well received. The stock was done daily at very steady figures; and the quotation improved a point. Of the secured issues, only the debenture was strong; and it looked like making an advance. Not much was done in South Metropolitan; but the transactions indicated apparent firmness. A few deals in Commercials were marked at only moderate figures. Hardly anything was done in the Suburban and Provincial group, and there were no changes in the London market; but locally Liverpool and Newcastle each had a small advance. Business in the Continental companies was quiet. Most of it was in Imperial, which was not very strong, though the closing mark was the best of the week. None of the rest made any show, except Ottoman, which fell back half-a-point. Business in the Water Companies continues at the same low ebb, with hardly any vitality in it. Prices are poor; but the only actual fall was a point in East London.

The daily operations, being practically very uniform, call for no further detailed notice. The movements were: Ottoman fell ½ on Thursday; and Gaslight ordinary rose 1 on Friday. East London Water fell 1 on Wednesday.

FRENCH ARTISTIC LIGHTING APPLIANCES.

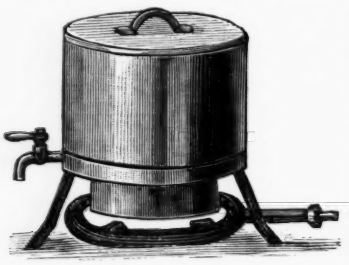
In the notice of the proceedings at the last meeting of the Société Technique du Gaz en France, which appeared in the "Journal" for the 19th of May, it was mentioned that a prize of 200 frs. had been awarded by the Committee to MM. Boulanger and Roux for artistic gas-fittings. The award arose out of a project which, it may be remembered, was initiated at the International Gas Congress held in Paris in 1900, to reward by premiums makers of lighting appliances combining artistic design with adaptability for use with the incandescent system. The above-named firm have been particularly successful in satisfying the requirements of the Committee, for the present is the third occasion on which they have carried off a prize. The designs submitted by them last year were given in the "Journal" for the 21st of October (p. 1084); and below we reproduce, from the

"Journal des Usines à Gaz," the one lately premiated. It will be noticed that it is an arrangement of four inverted incandescent lamps, with a central one. All the ornaments are in cast metal; and the shade is of green or yellow silk, lined with white persian. The competition is open to all comers; and, according to our contemporary, it has been productive of very gratifying results, as each year there is an increase in the number of makers of gas-fittings who succesd in producing, at very moderate prices, more or less highly artistic appliances specially suited for incandescent gas lighting.

THE "PYRO" KETTLE.

There has just been patented by the Boiler Heater Company an invention having for its object to enable boiling water to be drawn off from a kettle without waiting until the whole of the contents of the vessel have become heated. This, of course, is accomplished by making in the kettle a division (provided with a small aperture or apertures through which the water can flow), to separate the top from the bottom portion. The result of this is that the water in the lower part can be very rapidly heated up to boiling-point, without being affected at all by that which is at the top of the vessel. In this way, as boiling water is drawn from the tap at the bottom, the cold water at the top passes through the division into the highly heated lower compartment; while, of course, the kettle may be replenished with water at the top, without any lowering of the temperature of the hot water which is at the time being

taken away from the bottom. The invention was originally intended to be utilized solely in tea shops, restaurants, and other large places where a practically continuous flow of boiling water is an absolute necessity. It was, however, very soon realized that the principle might with advantage be applied to kettles for use on gas and oil stoves; and suitably modified forms have been arranged accordingly. The name given to the appliance is the "Pyro" kettle; and we are informed that highly satisfactory results have been obtained in tests that have been made with it by the Gaslight and Coke and other companies. The idea is a simple one; and there seems to be no reason why it should not work well.



NATURAL GAS IN ENGLAND.

Since the formation of the Company which bears the comprehensive title of the Natural Gas Fields of England, Limited, the public have had no lack of opportunity of acquiring (through the Press) full knowledge of the aims, hopes, and doings of the undertaking. In spite, however, of all that has already been said, it is still possible to write a generally interesting article on the subject; and this task has been successfully accomplished by Mr. Inverness Watts, in the August number of "Cassier's Magazine." It is true Mr. Watts has not a great deal of information that is new to impart, and that most of the objects the Company have in view are still to be realized; but Mr. Watts's close connection with the undertaking renders him particularly qualified to give an account of what has been, and what remains to be, done.

The article in "Cassier's Magazine" to which we refer gives a history of the early discoveries of natural gas in Sussex; the first of those recorded having taken place as long ago as 1875, when, in making some experiments on the temperature in boreholes at various depths, an explosion occurred on lowering a light into the tube. Nothing seems to have resulted from the knowledge thus gained; and twenty years passed by before another discovery was made, in the putting down of an artesian bore in the yard of the new Heathfield Hotel adjoining the railway. Here, at a depth of 228 feet, gas was met with; and it was subsequently ignited, by means of small tubes, at a distance of fifteen yards from the borehole. No further steps, however, were at that time taken; and it was not until a third discovery the following year that means were adopted for utilizing this gift of Nature. On this occasion, the find was made about 100 yards away from the one the previous year—again when boring for water. As soon as the presence of the gas in some quantity became evident, all the wrought-iron tubes, with the exception of one, were withdrawn from the borehole. To the top of the tube left in the ground, a cast-iron cap was screwed, with a ½-inch bend and stopcock; and from this boring Heathfield Railway Station has, as readers of the "Journal" are well aware, been lighted with natural gas for about five years past.

But, of course, the Natural Gas Fields of England was not formed with the sole idea of making use of the gas obtained from this bore. A much more ambitious programme was contemplated, and the county has for miles round been thoroughly surveyed by English and American geological experts. Mr. Watts states that the reports of these gentlemen "are unanimous that the South of England promises to be a larger field than any America has yet known;" and it is to be hoped that this view will turn out to be the correct one. In the meantime, however, it must be admitted that "promises" play a very important part in the matter; and perhaps, until more extensive experience has been gained than seems at present to be the case, it will be as well not to raise too great expectations in the minds of the shareholders and persons having business interests in the locality. Certainly, the Company have put down six other borings besides the one at Heathfield; but though gas is said to be met with at the same depth and pressure in each instance as was the case there, some more conclusive evidence (which time alone can furnish) is desirable as to the probable extent of the supply. It may be that this is to all intents and purposes inexhaustible—at all events, no one can say definitely that it is not so—but for the present a cautious attitude will be the wisest one to adopt. Should the hopes of those connected with the Company be realized, everyone will admit that the effects cannot fail to be of a most far-reaching character; but, as a somewhat parallel case, we cannot forget the extravagant ideas indulged in, at the time of the starting of shaft-sinking into the Kent coal measures, with regard to the industrial revolution that would be wrought in the county thereby. Six or seven years have since gone by, and yet there is no sign of an early fulfilment of this pleasant dream. It is true the efforts of the Kent Colliery Company may at some time or other be crowned with success; but it is difficult to imagine an iron foundry being put down in the locality at the present stage of the operations. The matter is still very much "in the air;" and this, we venture to think, must to a less extent be described as the state of affairs in connection with the natural gas fields. But, at any rate, the Company have given proof of the faith that is in them; for we learn that they "have acquired large areas of freehold land suitable for factory purposes, to be supplied with gas both for lighting and power purposes at a few pence per 1000 cubic feet." Mr. Watts adds that already many large manufactories are on the point of being started, and several glass makers are arranging to commence operations at Heathfield with the new fuel. This, at least, is something beyond what has been accomplished towards the turning of Kent into an industrial centre.

Beyond describing the early discoveries in Sussex, Mr. Watts gives some interesting particulars regarding the gas which has been found. The pressure in the more recent borings is as much as 200 lbs. to the square inch; and even taking a minimum of 120 lbs., this is stated to be more than sufficient to carry the gas to any large city in England. One of the first steps taken by the Company on its formation was to instal a 1½-horse power gas-engine, worked by natural gas, to pump water at Heathfield Station; and this has since worked most satisfactorily. The consumption of the engine, Mr. Watts says, equals 15 cubic feet per indicated horse power; whereas with London gas from 20 to 25 cubic feet are needed. Tested in an argand burner, the gas gave an illuminating power equal to 14 candles; while in an incandescent burner it furnished 20 per cent. more light than did coal gas under the same conditions. Both these tests were, of course, made with the natural gas exactly in the same condition as it issues from the boreholes, without purification or enrichment. It seems, therefore, that the only question is as to the extent of the supply; and no doubt the Company will continue their efforts to set this matter at rest—as far as it is humanely possible to do so.

COMMUNICATED ARTICLE.

PUSHING THE GAS BUSINESS IN SHANGHAI.

By H. King Hiller, M.Inst.M.E.

An increase in consumption from 79 millions in 1894 to 194 millions in 1902, or 145 per cent. in eight years, is an experience which falls to the lot of few companies. The writer therefore believes that a short account of the methods adopted, and which have led to these results, may prove interesting reading. The normal artificial lighting in use by the Chinese is still the floating wick in vegetable oil, or the hardly less objectionable soft tallow candle. This primitive system has been gradually giving place in Shanghai to the paraffin or kerosene lamp; and it is principally against this cheap and effective illuminant that the Shanghai Gas Company have had to fight. Owing to the unwillingness of the Chinese to adopt gas as their lighting agent—mainly owing to their dislike to "scrapping" their old and well-tried lamps—it was realized as long ago as 1889 that if any headway was to be made, the traditional policy of *laissez faire* would have to be abandoned, and a bolder bid made for popularity and success—even if the proverbial conservatism of the natives had literally to be overcome by the substitution of new lamps for old ones. These were the days when the automatic prepayment meter was still in swaddling clothes. In Shanghai, however, as the meters were read and the accounts rendered monthly, the benefit of small accounts got in at frequent intervals was already obtained—a policy which the writer believes to be far preferable, and which certainly leads to less grumbling, than the larger quarterly accounts which are the rule with most British companies.

Shanghai is essentially a trading centre; being the collecting and distributing port for practically the whole of North China. Hither come the merchant and producer to buy and sell, and also to taste the joys of life in a great city. Miles of streets of shops, tea-houses, theatres, and other places of entertainment provided a large field for pushing gas sales. Handbills in Chinese were distributed far and wide; and a commission of about 1s. was given for each order brought in by any of the Company's fitters. What was offered was free fitting "on loan," with iron-barrel tubing, of any shop for any number of points exceeding three, with free service-pipe and free meter (no consumer is ever charged meter-rent). The "loan" consumer had to supply his own pendants or brackets, burners, and any glass; gas being charged at the current rate. The system has been a marked success; the gas consumption by these "loan fittings" last year being 45 million cubic feet out of a total private consumption of 185 millions.

The method of obtaining customers of this description has been gradually modified and improved. To prevent fraud, deposits are now insisted on, and are paid willingly. Canvassing has been found more prolific than advertising; and to encourage this, instead of engaging paid canvassers, permanent employees of the Company in place of receiving a lump sum commission on the orders, are paid a percentage on the gas sold to consumers obtained by them. This percentage is calculated half-yearly,

and with the more energetic ones yields a very handsome addition to their salaries. The Company now supply iron pendants, and have extended the "loan" system to Chinese dwelling-houses, in addition to the shops. It may be mentioned that the piping is only nailed on the face of walls or ceilings; so that it is easily removed, and in condition for using over again.

The class of European who is supplied on the slot-meter system at home is practically non-existent in Shanghai; and it is not found necessary to hold out inducements to tenants to become consumers. What is done, however, is that, in cases where a landlord building new houses hesitates about providing the requisite piping, the Company meet him by offering to fix it at bare cost price, or even a little less. In this way, parsimonious landlords have the value of their property somewhat increased at the expense of the Gas Company; but, on the other hand, the Company obtain numbers of consumers who would otherwise never come on their books. A maintenance branch, for looking after the incandescent burners of consumers, has been established; the work being done for 4d. per burner per month. Mantles are sold at 5d. Ordinary slit-union burners are changed free of cost when defective.

Gas-engines have been sold on hire-purchase agreements since 1896; and at present they number over 70. The largest in use are for electric lighting; and to encourage this branch of the business, and also to recover some of the ground lost to an energetic Municipal Electricity Department, the Gas Company are offering to find the necessary capital to instal independent gas-driven dynamos, and to repay themselves out of the difference between the cost of generating the current and the price per unit at which the consumer pays the Gas Company, which price is always below the municipal rate. When the capital is in this manner all repaid—which takes about five years—then the plant is handed over free of charge to the consumer, who thereafter operates it for his own benefit. The advantages of this system are twofold. The consumers get a first-class electrical installation practically free of cost, and the Gas Company obtain a permanent customer whose consumption will run into millions of cubic feet a year. The total horse power used for electric lighting to date is just under 400.

Nothing has been said about cooking and heating stoves. With the latter, a very fair business is done during the winter; but, as regards cookers, the native domestic servant question raises almost insuperable difficulties in securing their adoption. Persistent advertising and canvassing, with generous treatment of consumers, has paid in Shanghai, and will do so elsewhere.

PERSONAL.

Mr. J. W. Helps, the Engineer and General Manager of the Croydon Gas Company, has been re-elected Chairman of the Polytechnic Committee of the Croydon County Council for the ensuing year.

Mr. Harry Ruggles, an Assistant at the Northampton Gas-Works, son of Mr. C. F. Ruggles, of Leighton Buzzard, was appointed, last Friday, Manager and Secretary of the Irthlingborough Gas Company, Limited, in succession to Mr. H. Rowley Wimhurst, who, as already announced in the "Journal," has been selected as Gas Manager at Spalding. Both gentlemen will take up their new duties on the 1st prox.

Mr. Alexander Smith, who has been Engineer and Manager of the gas-works in Aberdeen for the past 36 years, is obliged to retire from the post on account of ill-health. He served the Aberdeen Gaslight Company as Manager for four years, and on the transfer of the undertaking in 1871, he remained in the service of the Corporation. For about two years he has been suffering from softening of the brain. The Town Council granted him leave of absence, and so far back as November, 1901, appointed Mr. S. Milne, one of the staff, to be Assistant-Manager, in order to relieve Mr. Smith as much as possible. A letter has now been received from Mr. W. M'Queen Smith, intimating, with regret, that his father will be unable to resume active work; his medical adviser holding out no hope of his ultimate recovery. In these circumstances, he has been asked by Mrs. Smith and the other members of the family to request the Council to relieve his father of his official duties.

OBITUARY.

The death occurred on the 3rd inst. of Mr. James Heaps, who had been in the service of the Manchester Corporation for a period of 38 years. He began in the Water-Works Department, but shortly afterwards was transferred to other work. In 1872, however, he returned to the department, in the capacity of Collector, which position he held until his death.

The late Mr. E. Woods, a Past-President of the Institution of Civil Engineers, whose death, at the advanced age of 89, was recorded in the "Journal" for June 23, left estate valued at £128,012 gross and £126,252 net.

TECHNICAL RECORD.

THE MANUFACTURE OF SULPHATE OF AMMONIA.

By George Keillor, Jun., Peterhead.

[A Paper read before the North British Association of Gas Managers.]

Is it profitable to manufacture sulphate of ammonia in small gas-works? There was a time in the history of the gas industry when the residual tar and liquor—then aptly designated "secondary products"—were a positive nuisance in the hands of the gas manufacturer. The pioneers of our great industry were so intently engaged upon the invention and perfection of apparatus for the economical production of illuminating gas, that little time was given to the investigation and practical development and disposal of the crude tar and liquor. It therefore remained for a later school of chemists and engineers to investigate and discover the intrinsic value of tar and ammonia, and also to establish the manufacture of the new products upon a practical and commercial basis.

In reviewing the historic period of our industry, and passing down through the vicissitudes of the past to the present time, one is amazed at the enormous extent to which an absolutely new chemical and engineering industry has grown up out of the hitherto despised and useless bye-products of coal-gas manufacture. This new industry—whose talons are deeply fixed in the system of the gas industry, and upon which it depends for its existence—has sprung up within the past quarter of a century, and almost simultaneously with the rapid development in the practice of coal-gas manufacture. It was brought into being at a time when the nuisance caused by the running to earth of the raw tar and liquor was threatening to limit the use and popularity of gas for illuminating purposes; and it was not until Hofmann and Mansfield had shown the presence of benzene in gas tar oil, and after Perkin's discovery of mauve in 1856, that the great change came which created a demand for the secondary products of gas-works, and made it possible, for the first time, to obtain a revenue from them. By this time the new child of the gas industry had been adopted by strange and omnivorous people who had early foreseen the importance and enormous value of gas tar and liquor. High prices, therefore, did not obtain for long; for, whenever the guardians of the young industry became imbued with a sense of its importance, they at once made up their minds to mulct the ageing and sorrowing parent—a fact which they have succeeded in doing to a pretty considerable extent, as witness the low prices now obtainable, and the many worried countenances in this audience.

Notwithstanding the progress that has been made in the practice of coal-gas manufacture, together with the knowledge we have acquired of its many and varied ramifications, it seems strange that the gas engineering profession should be content, at the present time, with an arrangement which existed in the infancy of the industry. For it is true that the universal method in vogue, of disposing of the crude tar and liquor at so much per ton of coal or per 100 gallons sold, and in accordance with the Twaddel hydrometer, remains what it was in our forefathers' time, and before they, even, were aware of the possibilities of working up the products economically at the gas-works. We pride ourselves, and that rightly, upon the importance and greatness of our industry; but, keeping in view the enormous advance in present-day practice as compared with the past, can we pride ourselves upon this system of disposing of our crude tar and liquor in bulk? In my humble opinion, it is a peculiar abortion in what might otherwise be termed a mature and beautifully-arranged scientific process. It remains to be said, however, that several of our more progressive members have within recent years forged so far ahead in this particular line of development that their modern practice has quite transformed the meaning of the term "secondary products," which is now a misnomer and not applicable in the sense that it once was.

Nature having endowed me with a highly developed bump of modesty, I hesitated to come forward and ventilate myself upon this important and contentious subject. I suggested to our worthy President that a more experienced sulphate maker should be asked to open this discussion. But he pointed out at the time that I represented the smallest gas-works in Scotland working up its own tar and liquor, and that my experience would likely be of more value than the experience of a manager representing larger interests. Needless to say I consented; and the President, having made his choice, must be responsible if I do not fulfil his expectations and yours. I do not apologize for this paper; but I do regret having nothing absolutely new to tell you. It is extremely difficult to serve you with new matter upon this subject. Therefore, if I weary the more learned in recounting details, perhaps they will forbear with me, knowing that the information

may be new and interesting to a large number of the smaller and less fortunate, though none the less important, gas managers.

I may say at the outset that it is not my intention to dip deeply into the chemistry of the subject. That has already been done upon numerous occasions, and by experts whose work has been faithfully and fully recorded in the pages of the various technical journals, and which would well repay further study. My intention is rather to bring before you such practical information and observations as may be helpful to those contemplating the erection of sulphate plant in small gas-works; and my object will have been attained if it results in leading those minds into new avenues of thought, with the ultimate attainment of larger profits. Not the least contribution to the subject upon this occasion will be the discussion at the close of the paper; and I would ask all those with information at their disposal to give it to the meeting freely.

As far as my present knowledge goes, this subject is being introduced to the notice of the North British Association of Gas Managers for the first time. [When I wrote these words, I believed them to be true; but I have since been informed that a paper on the subject was contributed to this Association by Mr. Cowie, of Tillicoultry.] There have been references to it in addresses from the chair; but I understand this is the first time the Council have been in a position to give the members an opportunity of discussing a paper devoted entirely to sulphate of ammonia manufacture. However, although it has not been discussed by the Parent Association, it has been informally discussed by its offspring, the Scottish Gas Managers, at their meetings in 1898, 1899, 1900, and 1901. A re-perusal of the discussions which took place upon these occasions reveals, to my mind, at least three things—viz., the anxiety of gas managers to be delivered out of the hands of the distiller, and the need (as shown by the inconclusiveness of the information supplied) for a simple, practical, and reliable introduction to the new milch cow; also the curious, and I would say ambiguous, arguments urged against the adoption of the process of sulphate manufacture at gas-works.

I cannot save you from the arguments of your friends any more than I can deliver you out of the hands of the Philistines; but I think I may claim the privilege of being able to lead you to a land of promise where the pioneers in sulphate making have found peace and plenty. What are you getting for your tar and liquor? And, does it pay to manufacture sulphate of ammonia in small gas-works? These two questions have been much in evidence of late—indeed, so much so that whenever two or more gas managers come together, these immediately become the burning questions of the moment.

In these days of keen competition, our revenue must be maintained and increased by every means in our power; therefore the amount obtained for the available tar and liquor is of the highest importance, and is, to every gas manager, an asset in the yearly balance-sheet of the greatest value. It is probably the knowledge of these facts which exercises the minds of gas managers and compels them to search for an answer to the query, Does it pay to manufacture sulphate of ammonia in small gas-works?

I am told that in the West of Scotland the buyers of raw tar and liquor are in combination, and that this ring exists for the purpose of keeping the price of these products below par. If it is true that this alleged combination exists, then it is apparent, even to an outsider, why low prices prevail. Another and equally good reason for this may be the want of competing firms. If there were more of them, there would in all probability be more healthy competition. But few or many, I am afraid the result will always be the same, and year by year, as we offer our raw products for sale, the distiller will just as regularly send in his "ultimatum," knowing that it must be accepted. Why give him the chance? Truly the manager who sells his tar and liquor in bulk, and simply according to the Twaddel hydrometer without any reference to a sliding-scale, is in the hollow of the tar distillers' hand. The inference to be drawn from these words is not that the tar distiller is an unscrupulous person. It is anything but that.

The position of the manager whose works are situated in the same town, or in the same locality as the tar-works, is not an enviable one. Sometimes these gentlemen have to accept a lower price than their more fortunate brethren 20 or 30 miles away, even although their products are of the same quality. At the same time, it must be borne in mind that there are cases which prove the opposite, although, unfortunately, they are not in the majority. Again, there are others so badly situated, geographically, that they obtain little or nothing for their raw products after carriage and handling are deducted. Is it impossible to receive more? No. The panacea for all these ills is to be found in the erection of plant to manufacture sulphate of ammonia at the gas-works. But so long as gas managers refuse to adopt a process which has been tried and found successful, then so long must they be content with whatever tar distillers choose to give them.

During the past year, the prices of sulphate of ammonia and tar products have steadily risen; and this fact probably accounts for better prices having been obtained last year than for some years previously. But where an increase was obtained, was it in proportion to the rise in value of these products? I venture to think not. When contracts were made in 1902, the price of sulphate was about £11 5s. per ton f.o.b. Leith, while pitch was quoted at 16s. per ton only; but the market stiffened, and sulphate ultimately rose to £13 15s., and pitch to 56s. per ton. So that unless the raw tar and liquor were sold on a sliding-scale, the variations of which correspond with the quantity of ammonia in the liquor as ascertained by the distillation test and the market value of sulphate, crude naphtha, creosote, and pitch (an arrangement which I think should be more generally adopted), then the advantage and profit are all in favour of the buyer and against the seller.

I happen to know of one works, favourably situated, obtaining not less than 6s. 10d. per 100 gallons for their mixed tar and liquor. Assuming 50 gallons to be obtainable from a ton of coal, this sum is equal to 3s. 5d. per ton of coal used—an excellent result, and, if it could be maintained, is all that could be desired from this method of disposal. But if it pays the distiller to give up to 6s. 10d. per 100 gallons, supply barrels or tank-waggons, pay carriage to his own works, and have his margin of profit after allowing a proportionate sum for interest, depreciation, rates, and such like, surely it would pay the gas manager to work up his bulky liquor (and perhaps even the tar) into a more merchantable product at the gas-works. If he did this, he would then be in a position to sell his finished product in the open market, probably locally, and at full current prices. On reference to Table I., you will find that a works is represented as obtaining for mixed tar and liquor the very high figure of 3s. 8·09d. per ton of coal used. In explanation of this, I would say that the gas-works in question is adjacent to the tar-works, and that their tar is, probably, of very fine quality; also that their tar and liquor are sold under a sliding-scale. Hence the high price obtained. The spirit of the query, Does it pay to manufacture sulphate of ammonia in small gas-works? still haunts us. Therefore, to get rid of the apparition, and give it a real practical significance, I should say, Yes, in nearly all cases.

When considering the advisability or otherwise of adopting the process of sulphate manufacture, one should remember that sulphuric acid must be conveyed to, and delivered at, the gas-works; also, that where a local demand cannot be created, sulphate of ammonia must be carried away. So that the cost of carriage to the nearest merchant or shipping port must be considered. If these are not above the average, sulphate plant is a good investment for a 10 million cubic feet works and upwards.

When I was appointed to Peterhead in 1899, the residual tar and liquor were disposed of to a distiller at 9½d. per ton of coal carbonized. This distiller had a small plant over the wall from the gas-works, and upon the Gas Commissioners' ground. In May of that year, our contract fell to be renewed; and notwithstanding an endeavour on our part to obtain an increase, we were told that none could be given, as there was no profit in the business. The offer of 9½d. per ton was accepted, because the next best offer was to the effect that, while offering $\frac{1}{10}$d. per gallon for the raw tar f.o.b. Peterhead, they could not give us anything for the liquor, even at 6° Twaddel!

I had previously gone into the figures relative to the manufacture of sulphate of ammonia and the partial distillation of tar, and found, with no great surprise, that the erection of modern plant would be a safe and profitable investment. At that time, it appeared we could erect the necessary apparatus complete at a probable cost of about £650; and that after allowing for all working expenses, including interest and sinking fund charges, there would be a profit of about 2s. 6d. per ton of coal, as compared with 9½d.—the offer by the local distiller. Needless to say, the Gas Commissioners, with these facts before them, declared their readiness to adopt the process, and instructed me to send our avaricious friend, the tar distiller, an ultimatum in the form of a twelve months' notice to quit their premises.

The plant in use at this time was of the intermittent type, and it was employed alternately for the manufacture of sulphate and the boiling of tar. The distillation of the tar and liquor alternately in the same boiler gave no trouble; and while the sulphate made was a little darker in colour than ordinarily, it neither affected its quality nor limited its sale. Interesting as a description of this plant might be, time will not permit of it here. Suffice it to say that it required the regular attendance of one man, who also coopered barrels, retailed tar, and bagged sulphate, &c. The amount of sulphate made, and the results in general, satisfied the owner, who declared that his plant was second to none. Indeed, had this plant been in a better state of repair, and the price wanted for it more reasonable, I should have taken it over and given it a fair trial. A simple plant of this kind could be erected at the smallest of gas-works at little cost; and in localities far distant from tar-works its adoption would prove remunerative, even supposing it only allowed the manager to use stronger liquor in the purification of his gas, which could then be done at less cost.

You may now suppose that we decided to go in for the process of sulphate making. One of the first questions one asks oneself is, Which of the two systems should I adopt—the intermittent or the continuous? I think there can be no doubt as to the answer. At the present time no one with an exact knowledge of the ammonia industry would erect a plant of the intermittent type unless it were for the smallest of works, to suit peculiar circumstances, and for well-understood reasons. The continous working plant is the more scientific and economical of the two, and should always be adopted where cost and steam power are not the first consideration.

I quote the following from Dr. Lunge's great work on "Coal Tar and Ammonia," regarding the merits and efficiency of the different systems of distillation: "A practical experiment was

made by Dr. C. M. Tidy upon a quantity of 7000 gallons of ammoniacal liquor, with the following results:—

Method.	Hours.	Yield as compared by Theory.
1. When heated by open fire from without	22	90·0 per cent.
2. When heated by indirect steam (coil)	18	92·0 ,,
3. When heated by open (wet) steam	14	98·5 ,,

This proves that steam directly blown into the liquor is by far the best agent; no doubt because its heat is thus most directly utilized, and perhaps even more so as the steam mechanically carries away the ammonia."

The sulphate of ammonia plant erected at the Peterhead Gas-Works is of the continuous type. It consists of a primary still, the bottom part of which is used for liming the liquor, and the top part filled with helical trays containing cast-iron hoods with serrated edges, placed over and sealing the steam exit ports, with sealed overflow tubes for the liquor to pass from tray to tray. The secondary still is filled with trays similar to the above. There is also a saturator and draining table, superheater or economizer, condenser, and open oxide of iron purifier (a settling tank in our case being unnecessary), with a liquor regulating tank, acid and mother liquor tanks, and elevators, steam gauges and valves, together with all other necessary fittings and appliances complete. There is likewise a bench with chemical apparatus for testing the raw material and finished products; and we have storage room for 10 to 12 tons of sulphate.

The principle governing the action and working of such a plant is so well known that I shall not enter into further details here. The area occupied by the plant, exclusive of space for storage purposes, is 18 feet by 18 feet, or 324 square feet; but it could be housed in less space, and there would still be sufficient room for inspection purposes, and for easy working.

The sulphate plant, as erected with overhead tank and all fittings, and the necessary buildings, complete, cost	£400
The plant for obtaining boiled tar and crude naphtha, fixed upon foundations, and with all piping and connections, complete, cost	311
Total	£711

When we opened the offers for the supply of the above plant, we were surprised at the great differences in the amounts of the various tenders. Some manufacturers, in their anxiety to obtain an order for their special plant, almost promised to erect it free and for nothing, but upon certain conditions as to erection, which, if ever they are offered to you, be sure not to accept. In this particular matter, I would advise you to place your orders with a firm who have a reputation to lose. There are plenty of them up and down the country, and they are not difficult to find out. It was also amusing to read some of their statements. For example, one says: "All you have to do is to turn on the liquor and steam, and then go away and leave the plant for half-a-day, and when you come back the salt is drying on the table," or, in other words, "Just press a button, and in a short time the plant will turn out first-class sulphate, even to the recharging of the saturator, all without supervision." Another: "Just place the plant in close proximity to the retort-house, and a stoker, for an extra shilling or two per week, will do all that is required in the way of labour." Needless to say, stokers are, as a rule, fully employed in the retort-house; so that chimerical statements like these should not be accepted as gospel by those contemplating the erection of sulphate plant in small gas-works. I mention this matter just to show you that there is need for much discrimination in the selection of a sulphate plant and a contractor.

When working under all-round perfect conditions, it may be possible to achieve the results claimed by some makers; but in my experience, and while working under the conditions generally obtaining in small gas-works, I have found it useless to expect the plant to work uninterruptedly for more than an hour or two at a stretch. In my opinion, it is necessary in the working of small plants to make ample allowance for labour and maintenance charges when counting the cost. This is particularly the case wherever tar and liquor storage is low; and if overlooked, you will wonder at the end of the year where all the profit has gone to. In most small works, however, it would be quite possible to run a sulphate plant economically with the aid of the foreman (where there is one) and the occasional help of a yardman. In our own particular case, having the tar also to distil, barrel, and retail, it is necessary to employ a man specially for the work. He is, of course, held responsible for the economical working of the plants, and sees to the pumping, &c., of tar and liquor, as well as to the coopering of barrels, the bagging of sulphate, and other little duties. Owing to our forced method of working, he is fully employed thus for about nine months in the year.

It may be mentioned here that some consider a high degree of skill necessary in the manipulation and control of a sulphate plant. This is not the case, because a skilled attendant can be made just as easily as a skilled stoker; and when once the principle of the operation is thoroughly grasped, and the correct method of procedure fully established, there need be no difficulty on this score. I find it a good plan to interest the sulphate maker in his work by paying him a small bonus on the results of the year's working.

In selecting a plant, it is important to see that all hoods and overflow tubes within the stills are easily accessible for cleaning purposes. In some plants, this important detail is quite ignored, with the result that when a choke occurs much time and money (not to speak of the worry) are wasted in getting it cleared. I would draw your attention to the description of a new still which appeared in the "Journal of Gas Lighting" for March 31 last (p. 832). This new and improved still is by Mr. G. Wilton, of the Chemical Engineering Company, and would seem to be specially arranged for easy access to the interior of the still. The stills should always be coated with a non-conducting material to prevent loss of heat. This is not included by the firms offering to supply the plant unless specially desired; but it is of so much importance that it should never be omitted. Instead of coating with the usual material, which is destructible, I find it a good and cheap plan to jacket the stills with a sheet-iron covering. This is simply bolted close to the top of the still and left open at the bottom, with a clear space all round between the jacket and still for the retention of hot air. This has the advantage of being cheap, indestructible, and easily removed if need be.

The stills should be provided with facilities for testing the liquor at various points, also with pressure gauges, water gauges, and a safety valve. The construction of the superheater is also of importance, and nothing but the very best steam-tubes (if it is a tubular one) should be used therein. I have known of a tubular heater being fitted up with the lightest of wrought-iron tubes when the very best were supposed to be used, with the result that within twelve months they leaked badly, and liquor was lost thereby. If there is not an efficient acid catch-box between the saturator and heater, acid vapour will get forward and very soon destroy the tubes in the heater; but in the case referred to, this was not the reason for the rapid decay.

The stills and all ammonia gas-pipes must be kept as warm as possible, and the hotter the better (having regard to the quantity of steam being used). It is therefore imperative to have an ample supply of steam for the successful working of the plant. In our case, the steam is conveyed from the works boiler, a distance of 64 yards. The condenser is the next part of the plant requiring attention. Some prefer the air-cooled and others the water-cooled type of condenser. When a plentiful supply of water is not available, the air-cooled type recommends itself; but otherwise the water-cooled condenser is preferable. Indeed, if the superheater is made large enough, the condenser may be dispensed with altogether—at least so far as the smaller-sized plants are concerned. Where either type of condenser is in use, the Alkali Act Inspector recommends the devil liquor to be taken off at the hot end, as it then passes away to the sewer or settling tank practically free from sulphuretted hydrogen; whereas if it be allowed to run off at the cold end, it is fully charged with this evil-smelling gas, which is very soon objected to if it gets into the sewers.

Now a word or two about the saturator, which is of great importance. The saturator supplied with our plant was made of solid-plate lead (milled lead) ½-inch thick all over, and cased with 3-inch timber and ¾-inch bolts and nuts. This saturator was split and leaking within fifteen months after being brought into use; and from what I have been able to learn from others, it would seem that we are not singular in this respect. A leaky saturator, besides being wasteful, is an intolerable nuisance and a perpetual worry. Therefore, take warning in time, and when obtaining offers for a sulphate plant specify a saturator the maker of which will give a five years' guarantee along with it. Be careful neither to take a saturator of cast lead nor of sheet lead, but one of real solid rolled plate lead and with the least possible seams.

A saturator of this type should be at least 1½ inches thick in the bottom, 1¼ inches in the sides, and ¾ inch thick in the dome, Also be careful that the ammonia and waste-gas pipes should be so connected as to convey as little vibration as possible to the saturator. A saturator of this thickness will cost more at the start; but it will be the cheapest in the end. I would also recommend the provision of a steam-pipe within the saturator. This is useful for melting the hard salt deposited on the ammonia pipe, also for picking up the heat of the saturator at the commencement of the operation. If a steam-pipe is not used, it is best to heat up the saturator with its contents as low as possible, as there is always a good deal of condensation going on at the time, which weakens the acid and necessitates its removal for stronger acid. When a steam-pipe is used, the saturator may be charged up at once, and the heat raised simultaneously with the rest of the plant—thus saving time. We obtain the best results when working the saturator three-quarters full at 68° Twaddel, and a temperature about 225° to 230° Fahr. By working at this strength, we never require to run in fresh acid during the process of fishing out the salt; and when the "batch" is off and the saturator "low," the remaining acid is at or about 54° Twaddel, and just beginning to turn neutral, whereupon the saturator is again charged at 68°.

The salt thus obtained is white, dries easily, is of first-class commercial quality, and has a ready sale. As the result of my experience with a leaky saturator, I would recommend that the floor underneath the saturator should be so formed and lined with sheet lead that if any leakage took place it would drain towards the mother liquor well or another tank provided for the purpose, and thus be used over again as desired. It is also a simple and inexpensive matter to form a lead gutter all round the saturator, so arranged that in the event of a "boil over" the liquid would drain to the nearest tank, instead of running all over the floor and being lost, as is generally the case.

In contemplating the erection of sulphate plant, one of the most important things of all is to see that there is plenty of liquor storage accommodation at the works; for if this does not obtain, then the tar cannot be properly separated from the liquor, and much trouble will be the result. The less light tar the liquor holds in suspension the less trouble there will be with the stills. It is the tar getting into the stills and becoming pitched in the trays, thus blocking the steam and liquor passages, which causes trouble and worry. You will, therefore, understand why it is so necessary to make provision for the complete separation of the tar from the liquor; and, if a special form of separator is not available, with separate tanks for the reception of the different liquids, then ample storage should be provided for settling purposes. But it is not always possible to obtain this, no matter how desirable it may be. At Peterhead, I may tell you, we manage to get along with an underground well capable of storing only 2½ days' maximum make of tar liquor (2000 gallons), and an overhead tank, erected to supply the sulphate plant by gravitation, capable of storing 1800 gallons. Under these conditions, one can readily imagine the difficulty, especially in the maximum demand season, of keeping the tar and liquor separate. The pumping and other arrangements for draining the delivery pipes and tanks after being in use are very simple, and now give no trouble. We also take the precaution to pass all our liquor through a fine gauze filter placed over the pipe leading from the liquor regulating tank to the heater. This filter is cleared as often as is found necessary; and it is surprising the amount of fine gritty material that is removed from its surface, and which would otherwise be carried forward and deposited in the stills.

In concluding this section of my paper, I would say that a continuous plant can only be wrought to the best advantage when there is a plentiful supply of clean liquor; and if the best results are sought for, this cardinal point must be recognized. It is not difficult to understand that a plant of this type, working continuously night and day, for (say) a week or a fortnight, or even a month at a time, will give much better all-round results than similar plant working intermittently during the day time or part of a week only.

We shall now proceed to consider the financial aspect of the question. The quantity of sulphate of ammonia made per ton of coal carbonized naturally varies according to the capabilities of the coal used for producing ammonia, the temperature of carbonization, and the efficiency or otherwise of the apparatus used in its production, and, of course, the care taken in thoroughly extracting it from the gas, also in storing the ammoniacal liquor when made. The quantity varies from 20 to 30 lbs., and even more, per ton of coal used.

I am not in a position to tell you the percentage of nitrogen in the coals we carbonize; but the average analyses of samples of our ammoniacal liquor from all sources, when experiments were being carried out last week with a view to making a defective scrubber more efficient, including the fixed ammonia in the spent liquor as it leaves the secondary still, is as follows, viz.:—

Specific Gravity.	Degrees Twaddel. Calculated.	Ounces Strength Saturation Test.	Volatile NH_3.	Fixed NH_3.	Total NH_3.	Spent Liquor Fixed NH_3.
1·018	3·6	7·5	1·58	·171	1·75	·176

The quantity of ammoniacal liquor of 10-oz. strength required to make one ton of sulphate of 25 per cent. strength is, approximately, 2600 gallons.

The fixed ammonia in the spent liquor can only be liberated by boiling in the presence of lime. We have never used lime at Peterhead on account of the extra trouble in removing the sludge from the stills, and owing to the danger of blocking the gas-pipes of the plant by the deposition of carbonate of ammonia, which is a hard substance and not easily removed. The chief reason, however, is because it would not pay to remove the fixed ammonia with lime costing 22s. 6d. per ton delivered. The quantity of lime required to recover the fixed ammonia in spent liquor was given by Mr. J. H. Cox (1883) at 50 lbs. of lime per 1000 gallons for every 100 grains of fixed ammonia that 1 gallon of the liquor contains.

The quantity of sulphuric acid of 144° Twaddel required to make one ton of sulphate is given in the "Gas World Year Book" at 2099 lbs. Other authorities give it as low as 1960 lbs. But it is a safe estimate to allow a ton of acid to a ton of sulphate. Our requirements are given later on.

The net cost to produce a ton of sulphate of ammonia varies with the facilities for obtaining a supply of acid, labour, cost of fuel, &c. For this reason, the net cost would not be the same in any two places; but even allowing for this there seems to be as much diversity of opinion in regard to the items to be included in the cost to produce a ton of sulphate as there is in the larger and more important question of carbonizing costs. Therefore, to prevent confusion, I have adopted the undermentioned basis for the purposes of this paper. The cost to produce a ton of sulphate, as given by Mr. J. F. Bell, late of Stafford, and appearing on page 106 in Mr. Charles Hunt's volume on "Gas Lighting" (1900), is £3 6s. 5d. This sum includes 2s. 6d. per ton for bags, which is not a manufacturing charge, and excludes interest and depreciation, which is. In 1894, Mr. Colson gave the cost at £3 18s. 10·05d., which includes a sum of 5s. 7·43d. for carriage of liquor and sulphate and 3s. 7·66d. for other than manufacturing charges. Again, in 1897, Mr. Wilkinson, F.C.S., puts the cost at £3 11s. 6d., inclusive of carriage on sulphate, bags, and broker's commission, amounting to 17s. 3d. In Table II., it will be seen that the average cost in Scotland, on the above-mentioned basis, is about £3 4s. 10d.

An analysis of our accounts for the past year shows that the cost to produce a ton at Peterhead is £4 19s. 7·19d., according to the following statement:—

Cost to Produce or Manufacture One Ton of Sulphate of Ammonia at Peterhead.

	£	s.	d.
Labour, making and storing		13	4·10
Labour and material, repairing plant, scoops, &c.		3	0·94
Selected chamber acid, 2358 lbs. at £2 15s. (strength of acid 144° Twaddel)	2	17	10·73
Fuel, breeze used, but (say) 8 cwt. coke, at 10s. per ton		4	1·26
Gas		0	9·94
Chemist's fees		0	9·60
Water			—
Bags			—
Registration fee		1	7·89
Broker's commission			—
Interest, £400 at 3½ per cent.		7	4·42
Sinking fund, £400 at 5 per cent.		10	6·31
Total	£4	19	7·19

A sulphate of ammonia works must be registered under the Alkali, &c., Works Regulation Acts, 1881 and 1892; and as the stamp duty on the certificate of registration costs in all cases £3 3s., this is included in the above cost to produce a ton of sulphate which it will be seen amounts, in our case, to nearly 1s. 8d. per ton of sulphate made. With regard to this charge for registration, I would say that it seems unfair to charge small works like (say) Peterhead or Selkirk, the same fee as works of the size of (say) Edinburgh or London.

The following are particulars of the past year's workings at Peterhead:—

Coal carbonized	3438 tons
Liquor produced (estimated)	98,800 gallons
Average strength of liquor	5¼° Twaddel
Sulphate of ammonia produced	38 tons
Do. do. per 100 tons coal	1t. 2c. 0q. 11¾ lbs.
Do. do. per ton of coal used	24¾ lbs.
Sulphuric acid used (144° Twaddel)	40 tons
Sulphuric acid used per ton of sulphate	1t. 1c. 0q. 6 lbs.
Total cost of sulphate made (exclusive of liquor)	£204 18s. 10d.
Net cost to produce and store one ton of sulphate	£4 19s. 7·19d.
Total cost per ton of sulphate made and sold	£5 7s. 10·37d.
Total amount realized for sulphate	£437 4s. 6d.
Average price received per ton of sulphate sold	£11 15s. 8d.
Net profit from sulphate	£232 5s. 8d.
,, ,, per ton of coal used	1s. 4¼d.
Boiled tar produced	37,100 gallons
,, ,, per ton of coal used	10¾ ,,
Crude naphtha produced	884 ,,
,, ,, per ton of coal used	¼ ,,
Net profit realized for boiled tar and naphtha	£282 9s. 4d.
,, ,, ,, ,, per ton of coal used	1s. 7¾d.
Net profit from sulphate, boiled tar, and crude naphtha	£514 15s.
,, ,, ,, ,, ,, per ton of coal used	3s.
Amount realized for tar and liquor, per ton of coal, before the manufacture of sulphate and distillation of tar was commenced	9½d.

These results are by no means the best, as you will doubtless find out during the discussion; but considering the inefficient state of our scrubbing plant, which in December last was passing 10 grains of muriate of ammonia per 100 cubic feet, they may be taken as fairly good.

Now let us see what is being obtained for these products elsewhere. In the "Gas World Year Book" for 1903 will be found analyses of the accounts of 16 gas undertakings making sulphate; and the average amount received by them for sulphate and tar is 2s. 7·25d. per ton of coal carbonized—the highest being 3s. 3·598d., and the lowest 2s. 0·160d. The average quantity of sulphate of ammonia made per ton of coal being 22·98 lbs.—highest 28·5 lbs., and lowest 13·9 lbs. Of course, this does not represent the best work being done in England, as only those undertakings mentioned in the "Year Book" are taken into account.

We shall now turn our attention to Scotland, and see what is being obtained for the crude tar and liquor at the gas-works. When circularizing the members of the North British Association, curiosity prompted me to ascertain how many gas-works in Scotland were manufacturing 20 million cubic feet per annum and upwards; and as the result interested me, it will probably interest you. Therefore I give the information in detail:

Works making under 10 million cubic feet per annum	147
,, 10 and under 15 millions	24
,, 15 and under 20 millions	9
,, 20 and under 50 millions	30
,, 50 and under 100 millions	17
,, 100 millions and upwards	13
	240

There are at present only 18 gas-works in Scotland manufacturing sulphate of ammonia; and as this represents but 30 per cent. of the works making 20 million cubic feet per annum and upwards—the size of gas-works invariably spoken of as being able to support a sulphate of ammonia plant—there is yet a good many remaining to adopt the process.

TABLE I.—*Gas-Works Selling Crude Tar and Liquor, 1902-3.*

Number of Works.	Tar and Liquor Sold—Mixed or Separate. (?)	Net Amount Received for Tar and Liquor. Per Ton of Coal Used.	Net Amount Received for Tar and Liquor. Per 100 Gallons Sold.	Degrees Twaddel.	Net Average Amount Received for Tar and Liquor for the last Five Years. Per Ton of Coal Used.	Net Average Amount Received for Tar and Liquor for the last Five Years. Per 100 Gallons Sold.	Distance from Nearest Distiller.
		s. d.	s. d.		s. d.	s. d.	
1	Mixed.	3 8·09 (*a*)	..	5	2 11·31	..	Adjacent.
2	,,	2 10·00 (*b*)	..	4 to 4½	2 6·20	..	½ mile.
3	,,	2 6·57	4 9·00 (*c*)	4	2 4 43	4 5·00	2 miles.
4	,,	2 6·00	..	4½	2 2·00	..	35 ,,
5	Separate.	..	{ 10 6·00 (*d*) / 3 6·00 (*c*) }	5	..	{ 6 7·00 (*d*) / 2 8·00 (*e*) }	½ mile.
6	Mixed.	2 1·32	..	4	..	..	70 miles.
7	,,	2 7·25	5 4·00	4½	..	3 8·00	2 ,,
8	,,	2 5·42	5 0·03	4	2 1·00	4 3·08	20 ,,
8½	,,	2 6·00	5 0·00	4	..	..	10 ,,
9	,,	2 4·75	3 10·25	5	2 2·50	4 1·50	50 ,,
10	,,	2 3·00	3 9·00	5	2 2·00	3 6·50	60 ,,
11	,,	2 1·00	4 0·00	5	1 11·00	3 9·00	35 ,,
12	,,	1 11·00	3 5·50	4	1 10·50	3 5·00	31½ ,,
13	,,	2 6·00	4 4·00	4½	1 9·00	3 6 00	18 ,,
14	,,	2 2·80	3 0·00	4½	1 8·00	2 8·80	30 ,,
15	,,	..	1 3·00	4	..	..	9 ,,
16	,,	2 0·00	4 0·00	6 to 9	..	..	..
17	,,	1 6·50	3 1·00	5	1 5·50	3 4·50	20 ,,
18	,,	2 5·20	4 7·00	4	..	3 8·40	6 (*f*),,
19	,,	1 5·00	3 6·00	3½ to 4	1 2·00	2 10·00	15 ,,
20	,,	..	4 3·00	6	..	4 3·00	30 ,,
21	,,	..	5 3·00	4½	..	..	6 ,,
22	,,	2 0·00	3 4·50 (*g*)	4½	..	..	70 ,,
23	,,	2 2·00	4 1·00	4½	1 10·00	3 6·00	15 ,,
24	,,	2 9·00	4 7·00	4	2 1·00	3 6·00	50 ,,
25	,,	2 6·27	5 3·50	5	..	..	7 ,,
26	,,	1 11·75	4 1·00	4½	..	..	10 ,,
27	,,	1 11·84	..	4½	..	..	16 ,,
28	,,	1 7·00	3 6·00	5½ to 6	1 6·00	3 3·00	70 ,,
29	,,	2 7·00 (*h*)	..	7	2 6·00	..	48 ,,
30	,,	1 7·75	6 6·00 (*i*)	5	1 4·00	4 11·80	16 ,,
31	,,	1 9·00	4 7·00	4	..	..	9 ,,
32	,,	..	4 3·00	4	..	4 0·00	5 ,,
33	,,	1 6·00	..	5	1 5·50	..	45 ,,
34	,,	2 0·25	3 10·00	4½	2 0·00	3 8·75	10 ,,
35	,,	1 10·00	3 9·00	4	1 10·00	3 9·00	..
36	,,	..	4 0·00	4	..	..	40 ,,
37	,,	..	4 0·00	4	..	3 6·00	5 ,,
38	,,	2 5·36	4 0·00	3½	1 11·05	3 3·00	1 ,,
39	,,	1 7·00	4 6·00	..	1 5·00	4 0·00	11 ,,
40	,,	0 6·00	1 3·00	4	..	1 6·00	30 ,,
41	,,	0 6·00	1 3 00	3½ to 4	..	1 3·00	40 ,,
42	,,	2 6·00	4 6·00	4	..	3 5·50	1½ ,,

(*a*) Sold upon sliding-scale principle. (*b*) Rate for 1903-1904, 3s. 2d. per ton. (*c*) Rate for 1903-1904, 6s. per 100 gallons. (*d*) Tar. (*e*) Liquor. (*f*) Not always successful. (*g*) Rate for 1903-'904, 6s. 6d. per 100 gallons at 6° Twaddel. (*h*) Large retail trade in raw tar. (*i*) Rate for 1903-1904, 6s. 10d per 100 gallons.

TABLE II.—*Gas-Works Manufacturing Sulphate of Ammonia.*

Name of Works.	Coal Used.	Sulphate Made.	Sulphate Made per Ton of Coal Used.	Net Cost to Produce One Ton of Sulphate of Ammonia.	Net Amount Received for Sulphate per Ton of Coal Used.	How Tar is Disposed Of.	Net Amount Received for Tar and Naphtha per Ton of Coal Used.	Total Amount Received for Sulphate, Tar, and Naphtha per Ton of Coal Used.	Average Amount Received for Raw Tar and Liquor before making Sulphate, &c., Per Ton of Coal.	Kind of Plant in Use.	Distance from Distiller's Works.
	Tons.	Tons.	Pounds.	£ s. d.	s. d.		s. d.	s. d.	s. d.		Miles.
Dundee	68,410	765	25·00	1 17 5 (*a*)	1 10·75	Raw	1 9·75	3 8·50	..	Continuous	..
Coatbridge	16,747	240	32·10	2 2 0 (*b*)	2 8·88	,,	1 2·60	3 11·48	..	,,	1
Hamilton	15,200	200	29·47	3 13 0	(*c*)	,,	(*c*)	(*c*)	(*c*)	Vacuum	10
Bothwell and Uddingston.	10,120	120	26·56	2 4 0 (*d*)	2 9·10	,,	1 3·10 (*e*)	4 0·20	1 7 60	Continuous	8
Kilmarnock	16,000	215	30·00	2 12 0 (*f*)	..	,,	..	..	..	,,	7
Arbroath	7,558	73	21·63	4 19 2 (*g*)	1 4·25	Distilled	1 3·00	2 7·25	..	,,	2
Peterhead	3,438	38	24·75	4 19 7	1 4·21	,,	1 7·71	2 11·92	0 9·50	,,	40
A	..	80	22·40	3 18 4	2 2·50	,,	2 2·00	4 4·50	1 9·00	Intermittent	40
B	..	36	..	3 13 2	..	Raw	1 6·00	..	4 0·00 (*h*)	Continuous	60
C	..	..	..	..	1 7·11	,,	1 0·81	2 7·92	..	,,	..
D	..	78	26·90	3 10 0	1 7·00	Distilled	1 2·00	2 9·00	..	,,	30
E	..	324	24·22	2 4 6 (*i*)	2 6·17	,,	1 10·70	4 4·87	(*j*)	,,	20

(*a*) Interest and sinking fund charges not included. (*b*) Sinking fund charge not included. (*c*) Figures not available. (*d*) Breeze used; no allowance made for fuel, gas, interest, or sinking fund charges. (*e*) Rate for raw tar, 1903-1904, 2s. 1d. per ton of coal used. (*f*) No allowance for sinking fund charges. (*g*) Includes renewal of saturator. (*h*) 4s. per 100 gallons mixed. (*i*) Does not include gas and interest on cost of plant. (*j*) Always made sulphate.

Through the courtesy of various works managers, I am able to place before you some tabulated comparative information relating to gas-works manufacturing sulphate and those selling their tar and liquor raw. The figures relate to the prices and other conditions obtaining during the year 1902-3. I am disappointed at not being able to give you fuller information with regard to the works making sulphate; but this is not my fault, and probably the gentlemen who were unable to supply me with data earlier will take this opportunity of giving the meeting the benefit of their experience. I shall not weary you by going through the following tables, which you may do afterwards for yourselves. Suffice it to say that the average amount received by those selling their tar and liquor raw is 2s. 1½d. per ton of coal carbonized, or 3s. 11¾d. per 100 gallons mixed—the average strength of the liquor being 4° Twaddel. Compared with this, the works making sulphate receive, on an average, 2s. per ton of coal carbonized for their liquor, and 1s. 5¾d. per ton of coal for their tar; the average for the sulphate and tar combined being 3s. 5¾d. per ton of coal carbonized. It would therefore seem to be the best, safest, and most profitable method to manufacture sulphate of ammonia at the gas-works.

It seems to me only the natural sequel to a long series of chemical operations, that the gas manufacturer should himself finish the work he began with the destructive distillation of the coal, and work up the residual tar and liquor to the best advantage at the works. Indeed, I do not see why the manufacture of sulphate of ammonia should not be a perfectly continuous process, going on at the same time as the manufacture and purification of the crude gas. This high ideal may seem to some a little chimerical, but personally I do not think it is altogether impossible of attainment. Probably in the not far distant future we shall be able, by some simple and inexpensive process, to absorb and ultimately precipitate the ammonia in the form of commercial sulphate, just as easily as we can at present absorb the ammonia in water but without the necessity for any further treatment in specially designed distilling plant, and even without the

aid of evaporation, as is necessary in the patent Mond process of ammonia recovery.

The newest process, of course, is the distillation of ammoniacal liquor for the manufacture of sulphate by the "vacuum" plant as erected at Hamilton; but until more particulars are forthcoming as to its general efficiency, it is impossible to advise its adoption. The system, it must be admitted, is a good one; but it is questionable if it is practicable for small gas-works. However, the manufacture of sulphate of ammonia, and the distillation of tar—and the further you go into the latter process, the more profitable it becomes—is a problem for all to work out for themselves; and as it is, moreover, simply a question of £ s. d., it should not be difficult to decide whether or not it would pay to adopt the process of sulphate making in a particular locality.

Discussion.

The PRESIDENT was sure they would agree with him that they had listened to a deeply interesting paper. It was upon a subject which touched them all, as was evident when they saw that there was 1s. 2d. per ton of coal going over to the tar distiller. This was a point that was well worth looking into.

Mr. J. WILSON (Tradeston), after some remarks about the prices they obtained for residual products in Glasgow, said that their saturator tank was of 15 lb. lead to the square foot; and it lasted from ten to twelve years. They were working nearly 200,000 tons of coal a year; and their present Contractors (who had had the contract for thirty years, with the exception of about five years), were now working with one-third of the men that were employed when half the coal was used as now. This was because the Contractors were expert ammonia makers. They had paid four different times to the Company £1000 a year for a patent; and this was the secret of their success.

Mr. W. FAIRWEATHER (Kilmarnock) said the paper was on an interesting subject to him, because they had worked a sulphate plant in Kilmarnock for, he should say, the last forty years, and had been very successful with it. He could corroborate every word Mr. Keillor had said in regard to the desirability of works above 10 million cubic feet starting the manufacture of sulphate. As to the remarks Mr. Wilson made regarding the thickness of lead in the cracker tanks, he thought it was on the right lines to have the lead pretty thick, because, when they had thin lead, they had to line their boxes afresh about twelve months afterwards. They then put in about 15 lb. lead, and since then had had no trouble. The general lines of the paper he quite agreed with in every detail.

Mr. T. WILSON (Coatbridge) said that Mr. Keillor had certainly been at considerable trouble in getting up his statistics. He did not wonder at his adopting sulphate manufacture when he had so much trouble with the tar distillers. He was in the fortunate position at Coatbridge of being able to distil both. They had manufactured sulphate of ammonia there for twenty-three years; and he had been fairly successful with it. He had also distilled the tar periodically; but he was now getting such a high price for tar that it did not pay him to distil it. With regard to the thickness of the cracker boxes, he had a man who made their saturators. He made one sixteen years ago, which was lined with 3-inch timber; and it appeared to be as good to-day as it was then. He thought it was a very wrong idea to constantly bring up and let down their saturators, because lead expanded, and it did not again contract. He could not understand how Mr. Wilson got the price he said.

Mr. D. VASS (Airdrie) pointed out that something ought to be charged for office expenses and superintendence. The distiller required to keep up a large staff, which had to be paid for out of his profits.

Mr. J. WHYTE (Seaham Harbour) said he was very much interested in the sulphate of ammonia business. He had been engaged in it for the last seven or eight years. They paid a high price for the raw material—about £3 5s. per ton; but he reckoned that he could make £2 profit upon that. He had been fairly successful. His works were too small for getting the results which some people did. His bigger neighbours got far better results than he did; for the reason that they could work their plant continuously from September right on to the end of May, which he could not. Personally, he was very much indebted to Mr. Keillor for the information he had brought forward. He would like to ask him what strength he found it best to work the liquor at.

Mr. L. HISLOP (Uddingston) said that Mr. Keillor did not say anything about the use of lime. In the ordinary course of working, he had made some pretty careful tests; and, as the result of the use of lime, he found that he could obtain an increase of 4 lbs. of sulphate per ton of coal upon what he got without lime. The cost of the additional plant was trifling; and so he thought it was better to have it. His liquor contained from 40 to 45 per cent. of fixed ammonia, which they could not break up—such as cyanides. In his district, they had a great deal of trouble with the County Council of Lanark. They could neither put their waste liquor into the drainage nor into the sewerage system, and he found a great deal of trouble in getting rid of it. He was now using it for watering the coke. In works making 20 million cubic feet of gas a year and over, it paid to go in for the manufacture of sulphate of ammonia. His plant was a 2-ton one, and cost somewhere about £475. It was more than repaid in fourteen months' working; so that he thought it would well pay any works of 20 millions capacity and over. He had tried the acid at all the different strengths, and he had never been able to take 24½ per cent. of ammonia out of the saturator at 68° Twaddel. He usually charged up to about 62°, put in from 3 to 4 cwt. of acid, and worked off the batch until he got down to 55° or 54°; but he had to run in fresh acid whenever he wished to take out the salt. In small works, there was a little difficulty in starting the plant and working it to begin with, till once they got a man to do the duty. But after they got a man who could do it, there was no trouble; any average labourer was able to pick up the business shortly. It was a very great advantage. He found a 2-ton plant to be considerably more than they required; but he had storage for 25,000 or 30,000 tons of liquor, and it was, he found, an advantage to have the large plant, because it was much cheaper to store the liquor and work it off two or three days at a time than to have a smaller plant.

Mr. T. WILSON said he did not use lime; and his yield was never under 32 lbs. per ton.

Mr. KEILLOR, in closing the discussion, said that Mr. John Wilson mentioned that ½-inch lead was too thin for a saturator. He quite agreed with that; but it must also be remembered that, even supposing the lead was as much as 1 inch thick, in a small works, where the plant had to be brought up and let down frequently during the year, there was considerably more splitting than there would be in a plant which was kept going during the whole year. Regarding the disposal of their green tar, he found that there was no outlet, comparatively speaking, for it, and it paid him to boil it. Mr. Vass spoke about office charges being included in the cost to produce sulphate of ammonia. He quite agreed with that; but in a small works like Peterhead, the clerk had sometimes nothing to do, and office charges on a small output would be infinitesimal. In the maintenance charges he gave, there was an allowance for management. Mr. Whyte asked the strength he found it best to work up the liquor at. He found about 5° Twaddel to be about the best. Mr. Hislop asked if he used lime or not. He did not, for the reason that he stated in his paper. The fixed ammonia in his liquor was only 1·79 per cent.; and with lime costing £1 per ton, it did not pay him to work it up. He also had no nuisance from the spent liquor. Probably their inspector was not so particular in the far north as in the south; but the fact that he ran the devil liquor in cold minimized the nuisance Mr. Hislop spoke of. He found 68° Twaddel to be the best temperature to work the saturator at. The acid he used was chamber acid, and not tower acid, which probably some used. It was strong acid of good quality; and he could convey it at practically the same cost as he could the lower qualities.

WESTERN (U.S.A.) GAS ASSOCIATION.

The Annual Meeting at Louisville.

(*Concluded from p.* 307.)

HEAT CONDUCTIVITY OF GAS-RETORTS.

Mr. H. A. Wheeler, of St. Louis, submitted a paper on the above subject. He obtained pieces of broken retort from four different makers, representing in each case normal, over, and under burning, and trimmed them down to a uniform size of 6½ in. by 8½ in. A small rectangular brick furnace 8½ in. by 6 in. by 7¼ in. high was provided. The method of procedure was to place the specimen to be tested across the top, leaving a slit 1 in. by 6 in. at each end for the escape of products of combustion, to apply the flame of a bunsen burner to the underside, and note the temperature indicated by a Green's high-grade thermometer placed on the upper side, every ten minutes. The entire top of the specimen, including the thermometer, was covered with eight thicknesses of asbestos cloth, to prevent radiation of heat; and the bulb of the thermometer was covered with steel filings to ensure a good contact. The samples differed slightly in thickness in different parts of the same specimen, and pieces that were convex gave a slightly better result than those that were flat. Starting at a temperature of 74° to 82° Fahr., it was found that the rate of transmission of heat through the specimen was very slow for the first ten minutes, with a temperature of about 1400° Fahr. on the underside. One set of specimens showed no increase at all. It was less slow for the next 10 or 15 minutes; and after that the rate of transmission was uniform and regular for an hour in every case. Afterwards, it was less rapid, until in about three hours a fairly constant temperature was reached. The first 1½ hours' heating brought out the heat conductivity of each specimen. This was shown by a diagram, which indicated a marked difference, not only between the different groups of samples, but between members of the same group. The thickness, specific gravity, porosity, proportion of burnt or old clay used in preparing the mixture, and shape, were physical conditions that exercised some influence. The thickness ranged between 2·78 and 3·35 inches, the specific gravity from 2·26 to 2·43, the porosity was shown by the percentage of water taken up in twenty-four hours (which ranged from 7·3 to 13·7), the hardness 3 to 6 on Mohrs' scale, and the proportion of burnt was low in one sample, very large in two, and large in the fourth. The factor of thickness is very important; the results of all the tests

going to show that the heat conductivity varies inversely as the thickness. Therefore the thinner a retort, the more rapidly will it work off the charge. Ordinary retorts might be made thinner to the extent of 10 to 15 per cent., with a corresponding increase in conducting power. Difference in specific gravity showed no marked influence on the results. The porosity showed a decrease, and the hardness an increase, according to how far the burning was carried; but the extent of porosity did not appear to have a strong influence. The burnt or non-shrinking material varied greatly in kind and amount, and the data indicated that it was not such a good conductor as the fresh material. Increase of burnt decreased the heat-conducting power; but unfortunately makers were reticent as to the actual proportion used. The relative efficiency of three samples—the fourth was not obtainable in large enough pieces to make a fair comparison with the other three—was about 100, 115, and 140. But the author thought it was quite likely that retorts made in the same works from the same material might show as much difference.

The President, in opening the discussion, enlarged on the importance of heat conductivity, and thought it was time that something more was provided in a retort than mere toughness. An increased conductivity of 50 per cent. would be a considerable advantage. Mr. Thwing remarked that in a short time the pores in a retort were filled with carbon, and therefore porosity tests were not of much value. He would like to see similar experiments on portions of retorts that had seen actual service. His experience was that the larger the proportion of burnt, the better the retort. It was more refractory and less liable to crack. He believed in improving the initial conductivity as far as possible, because the importance of this was not influenced by changes that may follow in working.

Municipal Ownership.

A paper on "Municipal Ownership of Public Utilities" was submitted by Mr. A. E. Boardman, of Brevard (N.C.). The tendency appeared to be in favour of trying municipal ownership as a panacea for all the ills and annoyances which the operation of utilities inflicted upon the communities in which they were located. The sharehelders naturally regarded it from a different point of view to that adopted by consumers. The contention in favour was that things which had become necessities and whose distribution demanded the use of the public roads, should be absolutely under the control and management of the public, and was applied to gas, water, electricity, and street railways. But, on the other hand, governmental activity should be limited to purely governmental functions. Capital and labour should have the largest possible scope; and there should be wise competition. But when Government usurped industrial enterprise, these conditions were interfered with, as also was the freedom of the ballot, by the enlargement of the number of voters in municipal employ, and party power was increased at the expense of patriotism. Capital and labour were interdependent, and restrictions on one meant restrictions on the other. All privileges granted to public companies should also carry reasonable obligations; but this did not mean municipal ownership. On the contrary, such ownership defeated the very object of a wise, disinterested governmental supervision, which should be exercised by competent persons, free from the influence of local prejudice; and therefore the State, and not the municipality, should constitute the advising board. Municipalities have powers to enforce regulations affecting the purity and efficiency of their supplies; but such powers are seldom used as against themselves. As soon as the city acquires the utility, it becomes the interest of the administration to hush up all complaints; and in many cases citizens bear without murmuring, because they realize the uselessness—a state of things that would certainly not be tolerated from private companies for a week. As examples, the gas supply and water supply of Philadelphia and New York were instanced. The fallacy of supposing that municipal management was more economical than ordinary company working, was exposed; and it was contended that the cost of a municipal undertaking was always greater than that of a well-managed private works. Had such ownership in any case resulted in the reductions of assessment or rates? And were low prices to consumers the rule in municipal-owned undertakings? The largest gas-works in the world, selling gas at the lowest rates, were owned by companies; and in England it was admitted that municipal ownership was not so advantageous as a regulated monopoly.

Discussion having been invited, Mr. Irvin Butterworth did not think that municipal ownership of gas-works was in active movement. He only knew of one instance in the last ten or fifteen years of a gas-works being acquired by the local authorities. There was rather more interest in acquiring electrical supply works. Before the responsibilities of municipalities were extended, they should make their present undertakings effective. Mr. Enright thought that so far from the question gaining favour, it was declining in public estimation. At Kansas, a scheme for acquiring an electric plant was overwhelmingly defeated. A daily paper published full details of all the municipal plants within 200 miles. After all, it was not a question of who owned the undertakings, but of how they were managed. The important thing for municipalities to learn was to be honest with themselves—to conduct their public affairs on the principles that are always applied in private undertakings; and until they had learned this lesson, it was not advisable to extend their responsibilities. Mr. Berkley thought that gas managers themselves were to some extent responsible for exaggerated ideas as to profits from gas working, and advised moderation and correct statements. If grand results were being obtained, let the balance side of the ledger keep silent sentry over such achievements. Mr. Harbison said that there was a great deal of talk about municipal ownership; but he would like to know whether, in most cities, there was anyone who could manage gas-works better than those who at present controlled them. He contended that where the company was competently managed, and did its duty, the consumers could not possibly be better off. Mr. D. M'Donald said that if the public were determined to have the gas-works, it was useless for gas men to try to stem the current; but they could see that, if the concern was bought up, a fair price was paid for it.

Concrete Purifier Construction.

Mr. F. H. Shelton contributed a paper (which was taken as read) describing a plan for quadrupling the capacity of an ordinary purifier-house at small cost, based on the use of concrete, by which means home-made apparatus could be constructed at half the usual cost. The New Orleans Gas Company had erected a set of four, 25 feet square, on the principle described by him at the last meeting of the Association. He now detailed an arrangement being carried out at Petersburg, Va., in which four purifiers, each 14 ft. by 5 ft. by 3 ft. deep, contained in a house 26 ft. by 32 ft., were being replaced by four concrete boxes each 12 ft. by 12 ft. by 7 ft. deep. The walls themselves formed two sides of the boxes, being lined with cement a few inches thick. The floor was formed by a layer of concrete, about 12 inches thick, laid with a fall to one corner; and a 4-inch pipe to receive condensed liquids was fixed in the lowest corner. The remaining sides were formed by two cross walls, 6 feet apart, carried from wall to wall, the space between them being used for connections and valves, and two cross or division walls. He believed the walls would be gas-tight; but if there was any doubt, they would be coated with paraffin applied hot. The boxes were fitted with bearing-bars supported on brackets bolted to the walls, at convenient levels for taking two deep layers of oxide. The gas entered between the two layers—one half going up and the other half down, and passing to a T outlet. The covers were of the dry-lute type, made of ¼-inch iron plate, stiffened with 3-inch L iron round the sides, and three rows of the same across the top. Strips of solid rubber, 1¼ inches in diameter, were cemented to the underside, and bedded on a 6-inch channel-iron fixed on the top of the walls. At 20-inch intervals, 1-inch bolts were built into the walls. These carry swinging dogs or cams, which locked by a wedge-action and gripped the cover. The covers were lifted by the same arrangement as used previously, which was not altered. The valve space was floored in flush with the top of the boxes. A large dumping bucket, carried on a light overhead rail, extending over each box, and also through the door to the oxide and lime sheds, was used for charging and discharging. It held several bushels, and was carried on light chain blocks, so that it could be lowered to the bottom of the boxes if desired. The gain of purifying area was six-and-three-quarter times that of the old boxes; and the rate of flow was further reduced by dividing the amount of gas into two, so that the time-contact was greatly increased. The alteration required no new buildings, connections, or lid travellers, and was easily carried out by the company's own staff. He suggested that in many other cases the purifier-house could be converted in a similar way.

Asphyxiation by Gas.

A discussion took place on the best treatment for cases of asphyxiation by artificial gas, and all sorts of ideas were suggested from the simplest up to inhalation of oxygen or nitrate of amyl, the injection of strychnine, and transfusion of blood. A Committee was appointed to investigate the matter and print some simple instructions in card form.

The meeting closed with the usual vote of thanks.

THE DIESEL OIL-ENGINE.

At the Summer Meeting of the Institution of Mechanical Engineers at Leeds a fortnight ago, under the presidency of Mr. J. Hartley Wicksteed, a paper on the above subject was read by Mr. H. Ade Clark, of the Yorkshire College.

Our readers are doubtless aware that the Diesel engine is an internal combustion motor intended to work with gaseous, liquid, or solid fuel; but as at present developed, it is a vertical oil-engine, working on the four-stroke cycle. The author opened his paper with a brief account of the inception and development of the engine. After careful analytical and experimental study of the present forms of heat engines, and after comparing their cycles of operation with the ideal Carnot cycle, Herr Diesel concluded that all existing engines were worked on defective principles, and that no radical improvement in their efficiences could result until those principles were altered. Rationally following up this destructive criticism, he proceeded to construct a new process for the utilization of the heat of a combustible in the

internal combustion engine, and finally laid down the following conditions as being essential for the utilization of the maximum amount of heat in the combustible: (1) The highest temperature in the cycle of operations must be produced by isothermal and adiabatic compression of the air only, previous to the introduction of the combustible. (2) The combustible must be gradually introduced into the highly-heated air in such a fine state of division that it is instantaneously burned, thereby supplying the heat necessary to keep the gases at a constant temperature during the period of combustion equal to that attained during the compression of the air. (3) The use of a large and definite excess of air proportioned to the heat value of the fuel is necessary, so that the temperature of combustion may be kept at the highest temperature of compression, and so determined that the engine may be worked and lubricated without using a water-jacket. The complete cycle for such an engine would be: (*a*) Isothermal and adiabatic compression to the maximum pressure and temperature. (*b*) Isothermal combustion, and finally adiabatic expansion to atmospheric pressure and temperature. This is, of course, the Carnot cycle; and Herr Diesel has here laid down the conditions necessary to obtain the most perfect combustion compatible with the maximum utilization of the heat in a possible engine.

The next step was to consider where and how far the ideal cycle could be modified, without unduly diminishing the actual and theoretically possible thermal efficiencies. After two years' experiment and discussion of results, the following modifications were adopted: (1) The attempt to obtain an isothermal step in the compression period was abandoned, adiabatic compression alone being employed. This allows the high temperature necessary at the end of the compression to be obtained without using an excessively high pressure; but it results in more heat being thrown away in the exhaust. (2) The expansion was not continued to atmospheric pressure, in order to reduce the bulk, weight, and cost of the cyclinder per horse power. An engine was built and worked on this modified cycle. It had a water-jacket, the upper temperature limit was 700° C. (1300° Fahr.), with a maximum pressure of 64 atmospheres (910 lbs. per square inch, and a theoretically possible thermal efficiency of 64 per cent. This experimental engine gave 12-horse power, 71 per cent. mechanical efficiency, and 26 per cent. thermal efficiency.

Having solved the initial difficulties of making an engine work successfully on the proposed cycle, it became necessary to construct a powerful motor without using an immoderately large cylinder. The solution was obtained by carrying on the combustion at the pressure of 30 to 40 atmospheres (430 to 570 lbs. per square inch) instead of isothermally. The result was, of course, an increase in temperature of such character that the water-jacket became necessary; and this was adopted in the final form of the engine. The actual Diesel engine has the following cycle of operations: The first stroke takes in air alone at atmospheric pressure and temperature; the second compresses this air to a high pressure (35 atmospheres = 500 lbs. per square inch) and to a temperature of about 1000° Fahr.; and the third is the working stroke, during the first part of which the combustion of the fuel is carried on at constant pressure for a period determined by the amount of oil to be sprayed in, which quantity is controlled by the governor; and the fourth stroke exhausts the gases.

The author furnished particulars of the construction and working of an 80-horse power single-cylinder Diesel engine, and gave the results of some tests of a 35-horse power engine at Harrogate (the first erected in England), as well as of a double-cylinder 160-horse power engine at the works of MM. Carels Frères, at Ghent; closing his paper with the following statement of the cost per brake-horse-power-hour of a Diesel engine compared with a gas and a steam engine:—

	35 B.H.P.	80 B.H.P.	160 B.H.P.
Diesel	0·59d.	0·39d.	0·32d.
Gas	0·69	0·52	0·40
Steam	0·89	0·63	0·49

In arriving at these figures, the author took crude petroleum at 45s. per ton for the Diesel engine, anthracite cobbles at 24s. per ton for the Dowson gas-producer, and coal at 12s. 6d. per ton for the steam-engine, which was one of the high-speed compound condensing type. The consumption of oil was taken as the mean between the full and half-power rates; of fuel for the gas-producer at 1·5 lbs. to 1·25 lbs. per brake horse-power-hour, *plus* an allowance for stand-by losses; and of fuel for the steam-engine at 4 lbs. and 3·5 lbs. for the lowest and highest powers, assuming an evaporation of 8 lbs. of water per pound of fuel used.

In the course of the discussion to which the paper gave rise, Mr. Dalby referred to the difficulty of getting suitable oil for the engine. Mr. Wilkinson, who erected the engine at Harrogate, said he thought that, as at present made, it was somewhat complicated, several of the parts not being accessible without removing others. Mr. Longridge said he had tested a 30-horse power Diesel engine at a pumping-station, and found the consumption of oil at 36-horse power to be slightly over ½ lb. per brake-horse-power per hour; but with no more than the proper full load of 30-horse power, it was somewhat less than the ½ lb. The thermal efficiency went up from 33 per cent. at the overload to 40 per cent. at the full load. He added that he had inquired as to the difficulties of working the engine, and had come to the conclusion that they could be easily overcome; so that he had no hesitation in heartily recommending it. Mr. Lupton thought the real interest in the engine was as a slow-combustion gas-engine. Professor Goodman considered the engine a great triumph for science, as never before had an advantage of more than 20 per cent. been obtained, whereas here they had an advance of 40 per cent. of thermal efficiency brought about by a process of theoretical reasoning. Mr. Lawson said he was able to speak of the Diesel engine from practical experience, and he had found that, under certain conditions, with steam, coal cost 0·637d. per Board of Trade unit, while the oil cost 0·375d. per unit; with a 45 per cent. load, the oil cost ⅛d. per unit. The cost of a 160-horse power Diesel engine worked out at £28 10s. per kilowatt. This included land, &c.; the engine being in complete working order. Mr. Day said the firm he was connected with had made tests with a 35-horse power Diesel engine, and had found that the earlier troubles had been overcome. Their results agreed with those given in the paper. Mr. Livens said that if the price of the Diesel engine were compared with that of an ordinary oil-engine, it would be found to be about twice as great; and the interest on the extra capital thus required would about pay for the additional oil that the ordinary oil-engine was said to need. He considered that the latter engine was more easy to manage and would cost less than the Diesel engine. It would not need so much care, as the pressure was lower; and for these reasons he was of opinion that the claims made for the Diesel engine were not sustained, so far as ordinary powers were concerned. Mr. Clark, in reply, explained that the price of coal given in the paper was arrived at by taking an average of the published reports of electric lighting stations. With regard to the Diesel engine being also suitable as a slow-combustion gas-engine, this, no doubt, was true; but at present it was being developed as an oil-engine. The cost of the engine might be high; but the invention was new, and the price would be lowered. The quantity of oil used would also be reduced; and he would say that in the future it would be one-third that needed to run an ordinary oil-engine.

A DE BROUWER CHARGING MACHINE FOR THE DERBY GAS-WORKS.

Readers may remember that in the issue of the "JOURNAL" for March 24 last there was given an illustrated article descriptive of a visit to M. de Brouwer at Bruges, to inspect his new charging machine. The article ended by saying: "It will be interesting to see who will be the first to adopt the invention in a British gas-works."

The Directors of the Derby Gaslight and Coke Company are entitled to be congratulated on being the first to place an order for a De Brouwer charging machine with Messrs. W. J. Jenkins and Co., Limited, of Retford—the sole makers of the "D.B. Coal Projector" for England and the Colonies. The intention is to erect the machine (along with the necessary coal-breaker, elevator, conveyor, and overhead coal measuring and storage chambers) in front of one retort-bench in the north retort-house at the Cavendish Street works. This is a small retort-house, containing six beds of eights, ⏀ section, 21 inch by 15 inch by 18 feet long, in through settings, heated by regenerative furnaces. The new installation will be worked by a 13½-brake horse-power gas-engine, which will be coupled direct to a dynamo of 5½ kilowatt output, to work the charging machine. The same engine will also work the coal breaker, elevator, and overhead push-plate conveyor; so the plant will be a compact self-contained arrangement, and will require little attention. The coal-hopper will be placed just outside the retort-house; the coal being tipped in from carts direct into the breaker. At both the Company's works, the coal has to be carted from the Great Northern Railway station—a distance of some 400 yards. This is done by the Company's own horses at a cost of about 4¾d. per ton, including the unloading of waggons and cartage.

It is intended, in the first instance, to charge the retorts by the machine in place of hand labour, but draw them by hand, so that an accurate account may be obtained of the saving effected by machine charging only. Probably, later on drawing machines will be added and coke-handling plant similar to that installed at the Litchurch works, which is one of the De Brouwer patent coke-conveyors, and has proved most successful.

Later we hope to give readers drawings, along with a full description of the plant installed, and after a few months operation, particulars of the working results actually obtained. The intention is to make this a trial installation, and keep a rigid account of all expenditure and the results attained, along with a comparison of the past working results from the same retort-bench with all hand labour.

A point of interest in this plant is the combination of electricity and gas for working same. Derby is already well to the fore in the utilization of gas-engines for generating electricity, as several plants have been put down by the Gas Company for electric lighting; and they have been a great success.

At the forthcoming meeting of the British Association, Dr. W. A. Bone will open a discussion on the general question of combustion by reading a paper on "The Combustion of Methane and Ethane."

DETERMINATION OF BENZENE IN GAS.

By L. M. Dennis and J. G. O'Neill.*

In 1891, Hempel and Dennis described a method for the volumetric determination of certain hydrocarbons that are usually present in illuminating gas.† Up to that time, all hydrocarbons in this product, with the exception of methane, had been determined by absorption with fuming sulphuric acid and had been classed under the general term "heavy hydrocarbons." It is true that Bunsen gives an analysis of illuminating gas in which the percentages of benzene, ethylene, and propylene are stated; but the amounts of these three gases were calculated by means of equations from the results of explosions with air and oxygen, and the calculation was based upon the assumption that the heavy hydrocarbons in the gas consisted only of ethylene, propylene, and benzene. It was ascertained by Hempel and Dennis that certain hydrocarbons (such as benzene and naphthalene) could be removed, in part at least, by means of absolute alcohol; the remainder of the heavy hydrocarbons being then absorbed by fuming sulphuric acid, and the methane being finally determined by explosion or combustion. In 1894, Noyes and Blinks adapted the method of Hempel and Dennis to the Bunte burette.

Recent work in our laboratory, however, has shown that while the absorption of benzene by means of alcohol may sometimes give agreeing results, the removal of the benzene is usually by no means complete, and the results at times show wide variations. The following analyses are given in confirmation of this statement. Air was drawn into a Hempel burette containing water as the confining liquid, and was measured. It was then passed into a gas pipette containing benzene, and was drawn back into the burette, and the increase in volume noted. The mixture of benzene and air was next passed into a pipette containing mercury and 3 c.c. of absolute alcohol, and was shaken for three minutes in contact with the alcohol. The residue was then drawn back into the burette, and was passed into a pipette filled with water, and was shaken with that liquid for three minutes to remove the vapour of alcohol. The gas was now drawn back into the burette and measured. The results (cubic centimetres) were as shown in the following table:—

Table I.

	I.	II.	III.
Air taken	67·0	50·0	52·2
Air *plus* benzene (C_6H_6)	73·0	54·0	57·0
After shaking with alcohol	69·0	51·8	54·2
,, ,, ,, water	68·4	51·4	53·7
Benzene taken	6·0	4·0	4·8
,, found	4·6	2·6	3·3

Experiments were next tried to ascertain whether repeated treatment with alcohol would remove all the benzene; and, as will be seen from the next table, it appears that this reagent is unable to remove benzene completely from mixtures of that substance with air.

Table II.

				Fresh Absolute Alcohol.	
	I.	II.	III.	IV.	V.
Air taken	58·6	60·1	63·0	56·8	67·9
Air *plus* benzene	62·8	64·6	67·0	61·0	72·8
After shaking with alcohol	59·8	61·6	63·8	57·8	69·0
After shaking with water	59·4	61·1	63·8	57·6	68·8
After second shaking—					
With alcohol	59·2	—	—	—	—
With water	59·1	—	—	—	—
After third shaking—					
With alcohol	59·1	—	—	—	—
With water	59·1	—	—	—	—
After passing residue into fuming sulphuric acid and then into the potassium hydroxide pipette	58·7	60·2	62·9	—	—

It was apparent from these results that, for the complete and speedy removal of benzene from illuminating gas, some absorbent other than absolute alcohol must be employed.

In 1897, Hofmann and Küspert described certain compounds of hydrocarbons with metallic salts, and stated that when illuminating gas acts upon a mixture of nickel hydroxide and aqua ammonia, there results a compound of nickel cyanide with ammonia and benzene—$Ni(CN)_2.NH_3.C_6H_6$. This statement led the authors of the present paper to examine into the action of an ammoniacal nickel solution upon benzene, with the view to ascertaining whether a method could be developed for the volumetric determination of the benzene present in the form of vapour in gas mixtures. Sufficient of the absorbent to fill a Hempel simple absorption pipette (that is, about 150 c.c.) was prepared by dissolving 25 grammes of crystalline nickel nitrate, $Ni(NO_3)_2.6H_2O$, in 50 c.c. of water, and adding 50 c.c. of strong aqua ammonia. The solution was allowed to cool, was decanted from any salt that separated out, and strong aqua ammonia was then added until the volume amounted to 150 c.c. The solution loses its efficiency if diluted with water, and its absorptive power is greatly diminished if nickel hydroxide is present in suspension. The analytical results given in this paper were obtained with the reagent prepared in this manner. Experiments showed that the solution absorbed nothing from the air, but that when shaken with a volume of air it gave off a small amount of ammonia gas. In the first series of experiments, it was sought to remove the ammonia by passing the gas mixture into a Hempel pipette filled with water; but, since this did not entirely remove the ammonia, it was found necessary to use (in place of the water) a 5 per cent. solution of sulphuric acid.

Later experiments by Mr. W. C. Geer have shown that it is quite possible to prepare the reagent in such manner as to do away with the necessity for the treatment of the gas mixture with dilute sulphuric acid. The method of preparing the reagent is as follows: Forty grammes of nickel nitrate are dissolved in 160 c.c. of water to which has been added 2 c.c. of nitric acid of sp. gr. 1·44. This solution is poured slowly with constant stirring into 100 c.c. of ammonium hydroxide, sp. gr. ·908. The resulting deep blue solution is used in the absorption. It has a very slight tinge of lavender. The odour of ammonia is noticeable, but is not strong. The few analyses that have been made with the reagent prepared in this manner indicate that it is similar in action to that prepared as above described, and that it is equally efficient. It should, however, be more thoroughly tested before complete reliance is placed upon it.

In the series of experiments now to be described, the analyses were carried out in a "simple" Hempel burette provided with a water-jacket, and water was used as the confining liquid.

Experiments were first made to ascertain whether benzene vapour mixed with air can be quantitatively absorbed by the ammoniacal nickel solution just described. The gas mixture was first passed into a pipette containing the ammoniacal nickel solution, and was shaken with that reagent for three minutes. It was then drawn back into the burette, passed into a pipette containing mercury and 5 c.c. of 5 per cent. sulphuric acid, and was shaken for three minutes, being then drawn back and measured.

Table III.

	I.	II.	III.
Air taken	52·7	48·6	51·3
Air *plus* benzene	56·4	52·4	55·2
After shaking with ammoniacal nickel nitrate solution	53·2	49·0	51·9
Do. with 5 per cent. sulphuric acid	52·7	48·6	51·2
Benzene taken	3·7	3·8	3·9
,, found	3·7	3·8	3·9

The above results show that benzene vapour is quantitatively absorbed by treatment with an ammoniacal nickel solution prepared as above, when the gas mixture is shaken with the reagent for three minutes. Results of approximate accuracy can be obtained by using a simple burette without water jacket; but there seems to be a slight heating of the gas mixture resulting from the absorption of the ammonia gas by the dilute sulphuric acid—this rise in temperature being sufficient to cause appreciable error in the final reading. To ascertain whether the time necessary for the absorption of the benzene could be reduced, other mixtures of benzene and air were prepared, and were shaken with the absorbent for one minute and for three minutes. The results showed that a three-minute shaking of the gas mixture with the absorbent is necessary for the complete removal of the benzene.

The next point to be ascertained was whether the nickel solution would absorb other constituents of illuminating gas, and would so interfere with their determination as to render its use for the absorption of benzene impossible. Measured quantities of carbon dioxide were mixed with measured quantities of air, and the mixture was passed into a pipette containing the nickel solution. As was to be expected, the carbon dioxide was completely removed. It had already been found that the nickel solution had no effect upon air, and consequently the absorption of oxygen in the illuminating gas by this reagent did not need further examination. To ascertain whether carbon monoxide and the unabsorbable residue (consisting chiefly of methane, hydrogen, and nitrogen) is affected by the nickel solution, the heavy hydrocarbons were removed from 100 c.c. of illuminating gas by means of fuming sulphuric acid and potassium hydroxide, and the residue was shaken for three minutes with the nickel solution, and then with the dilute sulphuric acid. No diminution in volume resulted. From these experiments it appears that the ammoniacal nickel solution beyond removing, wholly or in part, the hydrocarbons other than methane, absorbs no other gas except carbon dioxide; but the fact that this last-named gas is removed by the reagent makes it impossible to use the nickel solution for the removal of benzene and allied carbons, and still adhere to the order usually followed.*

In the customary procedure, the hydrocarbon vapours are first absorbed by alcohol, then carbon dioxide by caustic potash, and then the so-called heavy hydrocarbons by fuming sulphuric acid. Hempel and Dennis† state that carbon dioxide may not first be removed by means of potassium hydroxide, because benzene is soluble in that reagent. Experiments were made to ascertain whether or not this statement is correct. A measured volume of air was mixed with a measured volume of benzene vapour, and this mixture was passed over into a pipette containing potassium hydroxide. No diminution in volume resulted.

* From the "Journal of the American Chemical Society."

† See "Journal," Vol. LVIII., p. 395.

* See "Gas Analysis" (1902), p. 282. † *Ibid.*, p. 281.

It therefore appears that the absorption of carbon dioxide by potassium hydroxide may properly precede the absorption of benzene. To be perfectly sure upon this point, however, the following experiment was made: Three Muencke wash-bottles containing clear barium hydroxide solution were connected, and illuminating gas was passed through this chain. The carbon dioxide present in the gas was completely removed by the reagent in the first bottle. The gas issuing from the third bottle was, therefore, free from carbon dioxide, but could safely be assumed to contain some of all of the other constituents of illuminating gas. Of the gas issuing from the third bottle, 100 c.c. was drawn off into a Hempel burette, and was then passed over into the caustic potash pipette. No decrease in volume took place. A repetition of this experiment gave the same result; and there was thus obtained confirmation of the statement made above, that potassium hydroxide removes nothing from illuminating gas except carbon dioxide.

Experiments were next undertaken to ascertain, if possible, the nature of the hydrocarbons removable by alcohol and by the ammoniacal nickel solution. These hydrocarbons probably consist largely of ethylene, propylene, and benzene. The ethylene was prepared by treating pure ethylene bromide with a zinc-copper couple. The purity of the gas was tested by passing it into fuming sulphuric acid; the confining water in the burette having first been saturated with the ethylene. From 10 c.c. of the gas a residue of 0·2 c.c. was left, showing a purity of 98 per cent. Measured volumes of air were now mixed with measured volumes of the gas, and the mixture was passed into a pipette containing the nickel solution, and then into a pipette containing mercury and 5 c.c. of 5 per cent. sulphuric acid. The results obtained (cubic centimetres) are given in the following table:—

TABLE IV.

	I.	II.	III.
Air taken	49·2	51·5	48·0
Air *plus* ethylene	58·0	60·8	54·2
After shaking with ammoniacal nickel nitrate solution	58·8	62·4	55·1
Do with 5 per cent. sulphuric acid	57·9	60·9	54·2

It, therefore, appearing that ethylene is not taken up by the nickel solution, experiments were next carried out to ascertain whether benzene and ethylene could be separated by means of the nickel solution. The results of these experiments are as follows:—

TABLE V.

	I.	II.	III.	IV.
Air taken	50·20	60·7	48·90	54·4
Air *plus* benzene	53·00	64·2	51·10	57·2
Air *plus* benzene *plus* ethylene	57·60	68 7	57·20	64·4
After shaking with ammoniacal nickel nitrate solution and then with 5 per cent. sulphuric acid	54·70	65·2	54·90	61·6
Benzene taken	2·80	3·5	2·20	2·8
,, found	2·90	3·5	2·30	2·8
After shaking the residue with absolute alcohol and then with water	53·40	64·6	54·70	61·1
After treatment with fuming sulphuric acid and then with potassium hydroxide	50·70	61·3	49·70	55·3
Ethylene taken (88 per cent. pure)	4·60	4·5	6·10	7·2
,, found by alcohol	1·30	0·6	0·20	0·5
,, ,, by fuming sulphuric acid and potassium hydroxide after alcohol	2·70	3·3	5·00	5·8
Total ethylene found	4·00	3·9	5·20	6 3
Ethylene taken (corrected volume)	4·04	3·9	5·36	6·3

The results in Table V. show that a satisfactory separation of benzene from ethylene, and probably from the other hydrocarbons of the ethylene series, may be effected by first shaking the gas mixture with the ammoniacal nickel nitrate solution for three minutes, and then with a 5 per cent. solution of sulphuric acid for the same length of time.

It was hoped that it might be possible to remove the ethylene series of hydrocarbons by means of absolute alcohol before subjecting the illuminating gas to treatment with fuming sulphuric acid. If this were possible, the hydrocarbons would be divided, analytically, into three distinct groups, and a much clearer idea of the illuminants in the gas could then be obtained from the results of a volumetric analysis than is possible under the present methods. The results in Table V. have shown that the absorption of ethylene by alcohol is far from complete, and moreover, that the results of such absorption are by no means constant. It was thought desirable, however, before abandoning the separation by alcohol, to try the method with illuminating gas; and in the following table the results of these experiments are given:—

TABLE VI.

	I.	II.	III.	IV.
Carbon dioxide	1·2	1·2	1·1	1·1
Benzene by nickel solution and dilute sulphuric acid	1·2	1·0	1·0	1·0
Hydrocarbons removed by absolute alcohol and water	1·5	0·3	1·3	0·5
Heavy hydrocarbons removed by fuming sulphuric acid and potassium hydroxide	2·3	3·5	2·6	3·4
Total hydrocarbons absorbed by the three reagents	5·0	4·8	4·9	4·9

These results demonstrate most conclusively that absorption by alcohol cannot be employed for the purpose in hand, and that at the present time the gas analyst must content himself with the absorption of benzene by the nickel solution and the subsequent absorption of the so-called heavy hydrocarbons by fuming sulphuric acid. In the following table are given four analyses of illuminating gas, showing the accuracy of the determinations of carbon dioxide, benzene, and the heavy hydrocarbons:—

TABLE VII.

	I.	II.	III.	IV.
Carbon dioxide	1·2	1·2	1·2	1·2
Benzene by nickel solution and dilute sulphuric acid	1·0	1·0	0·9	0·9
Heavy hydrocarbons removed by fuming sulphuric acid and potassium hydroxide	4·0	3·9	3·9	4·0
Total hydrocarbons	5·0	4·9	4·8	4·9

Before the ammoniacal solution of nickel nitrate and the 5 per cent. solution of sulphuric acid are used for the absorption of benzene, the reagents should, of course, be saturated with the other constituents of the gas mixture in the usual manner. If the reagents in the pipettes have been used for the analysis of illuminating gas; they should not be used in the examination of generator or any other gas mixture differing appreciably from the illuminating gas; for the gases that have been dissolved by the reagent when it was shaken with the illuminating gas would escape into another superimposed gas mixture, if the latter did not contain these dissolved gases at approximately the same partial pressure as that at which they existed in the gas with which the reagent was first shaken. Consequently, the pipettes should be filled with fresh solutions of ammoniacal nickel nitrate and sulphuric acid whenever the gas mixture to be analyzed differs markedly from that for which the reagents had previously been used.

The results may be briefly summarized as follows: 1.—Under the described conditions, alcohol does not completely remove either benzene or ethylene from gas mixtures. 2.—The use of an ammoniacal solution of nickel nitrate furnishes a rapid and exact method for the determination of benzene in mixtures of that substance with air and ethylene, and in coal gas.

The authors would recommend that in the analysis of illuminating coal gas the order of procedure should be: (*a*) The absorption of carbon dioxide by potassium hydroxide; (*b*) the absorption of benzene by the ammoniacal solution of nickel nitrate above described; (*c*) the absorption of the "heavy hydrocarbons" by fuming sulphuric acid; (*d*) the absorption of oxygen by alkaline pyrogallol or by phosphorus; (*e*) the absorption of carbon monoxide by cuprous chloride; and (*f*) the determination of the methane and hydrogen.

The authors have been unable to try this new method on any commercial gas mixture other than the local supply of illuminating gas. They would therefore earnestly request chemists using the method on other gas mixtures to communicate to them the results of such analyses, and call their attention to any difficulties that may arise.

PROTECTION OF GATHERING-GROUNDS AND FILTRATION COMPARED.

By Professor S. DELÉPINE, of Owens College, Manchester.

[Summary of a Paper read at the Meeting of the British Association of Water-Works Engineers on July 21.]

This paper was one in which the author treated rather diffusely the subject mentioned in his title. The extent to which he went is shown by the statement that the communication covered 22 octavo printed pages. It was divided into four sections, which again were subdivided. The four sections, however, were entitled: (1) Pure water and how it becomes polluted; (2) Purification of pulluted water; (3) Protection of surface water against pollution; and (4) Conclusions. We cannot attempt to even indicate the contents of the first section. In regard to the second one, the author shows that filtration is a necessity in the case of river waters; and then dealing with the conditions of efficient filtration, he quotes, as the most authoritative statement on this subject, Koch's paper on "Water Filtration and Cholera," of which a translation will be found in the supplement to the twenty-second annual report of the Local Government Board 1892-3 (p. 439). He emphasized the necessity of means for meeting widely varying demands without overworking the filters at any time; the use of covered filters for preventing freezing; the use of means for regulating the flow of filtered water, and consequently the rate of filtration; the provision of means for testing bacteriologically the water immediately after it has passed out of each filter-bed; and the means for diverting water insufficiently purified. Following this appeared a summary of typhoid epidemics attributable to failure of filtration—ranging from 1882 to 1896. Upon this, the author went on to declare that sand filters are not entirely reliable barriers against objectionable bacteria; and he declares that it has been shown by several observers that bacteria contained in unfiltered water may pass through sand

filters, and be found in the filtered water usually in diminished numbers.

However, a little later he said that sand filtration of much polluted water can be effective is shown by the results obtained by various Companies supplying London with drinking water derived from the Thames. The death rate of London is remarkably low; and there is no clear evidence of the town having suffered to any serious extent from the pollution of this source of a large part of its drinking water. It must, therefore, be assumed that sand filtration, conducted as it has been in London under skilled supervision, and at great cost, has interposed a sufficient barrier between pollution and the consumer. Then as to high uninhabited moorland water, it is normally pure; and when it is peaty and soft, all it requires to be made a good drinking water is to be deprived of its suspended organic matter, and of its acidity and softness. This can be done in various ways; but, owing to the chances of occasional pollution which may occur when parts of the moors are inhabited or exposed to traffic, it has often been thought necessary to treat moorland water by sand filtration. This, in Professor Delépine's opinion, is often a source of unnecessary expense; and when sand filtration is not well conducted, it may be also a source of deterioration. An instance of such deterioration of a very good water came under his notice several years ago in connection with the water supply of a town in North Lancashire. Part of the supply was derived from barren uplands; the water being collected in a fairly large impounding reservoir. The water taken from the reservoir was bacteriologically and chemically very pure; but, after filtration, it was found to be very much contaminated. There could be no doubt as to the contaminating action of the filters. They were well constructed; and the superficial layer of fine sand was over 3 feet thick. At the time, the rate of filtration did not exceed $1\frac{1}{3}$ gallons per square foot per hour; and the head of water was 20 inches.

In order to find the source of contamination, the author had one filter-bed emptied, and holes made so as to expose the various layers of sand, gravel, and broken stones composing the bed; also the drains. Everything seemed to be in perfect order, except the drains. The water and the silt contained in these were all covered with a layer of slime almost entirely composed of bacteria. Various samples of water taken from the drains contained respectively the following number of aerobic bacteria per cubic centimetre: 4100, 2450, and 40,350. There could therefore be no doubt that in this case water originally good was being continuously contaminated by filters which had all the appearance of being well constructed. It is true that in this case the bacteria introduced into the water were not pathogenic; but it is not difficult to conceive how a temporary infection of a filter-bed with dangerous bacteria might lead to similar results under certain circumstances.

A careful consideration of the sources of failure of sand filtration led the author to the conclusion that, on the whole, sand filtration requires too much supervision and expenditure to be considered a perfect method of dealing with impure waters, and that in the case of pure waters, from which harmless impurities can be removed by mechanical methods more easily under the control of the engineer, the latter methods are preferable to sand filtration.

Regarding the protection of surface water against pollution, Professor Delépine said: Surface water from uninhabited, uncultivated collecting-grounds is, on an average, as pure as, or purer than sand-filtered water, except during periods of flood; and even in the latter case the increase of suspended matter does not render the water dangerous, but makes it less palatable and sightly. These defects can be overcome by storage in reservoirs, and by straining or mechanical filtration through comparatively coarse material. These methods of treatment are much more simple, more rapid, and more easily controlled than sand filtration. When the sources of pollution are not numerous, they are insufficient to increase materially the bacterial contents of the water collected in reservoirs. When a gathering-ground is only sparsely inhabited, the water obtained from the impounding reservoir is often apparently as pure as that issuing from ordinary sand filters. This is the result of a partial purification taking place in the superficial layers of the soil as the water gravitates towards the feeders, and also of the considerable amount of dilution resulting from the admixture of slightly polluted water with water issuing from unpolluted areas. Farms and manured grounds situated in close proximity to feeders, or on sharp declivities draining into them, may, however, cause considerable pollution of surface water, more especially during heavy rains; and for these reasons it is not desirable to trust to dilution, natural purification, or sedimentation in the reservoirs for protection against disease.

The protection of gathering-grounds must therefore necessitate a number of measures, the most important of which may be summed up as follows: (1) The portions of gathering-grounds in which the water is collected by means of natural open streams or artificial open drains should be entirely free from human habitations; and no house should be so situated that its drainage has naturally a tendency to gravitate towards the catchment area or the impounding reservoirs. (2) Public roads and paths should be diverted or closed whenever possible. When this is impossible, suitable fences or walls should be erected. The drainage from public roads should not be allowed to run into feeders or reservoirs. It should be carried out of the gathering-grounds. (3) Those parts of the gathering-grounds where the feeders are open may be used as sheep runs; but cattle should not be admitted to them unless access to the streams is prevented by fences placed at a suitable distance from the feeders. (4) In those parts, generally the lowest, of the catchment area where the water is collected by means of land drains, cattle may be admitted without serious inconvenience, provided the drains are covered with a continuous layer of soil at least 18 inches deep, and well turfed over. (5) Accumulations of decaying leaves in the bed or on the banks of the feeders should be prevented. The banks of the feeders or reservoirs should be free from trees or shrubs. (6) Storm water should be diverted from reservoirs by suitable trenches wherever the configuration of the ground indicates the need of this. (7) Each gathering-ground should be constantly supervised by one or several keepers to prevent the incursions of tramps or the disposal of refuse upon the ground. All these precautions are of a simple nature, and involve very little annual expenditure besides the wages of the keepers. Constant skilled and scientific supervision is unnecessary. To obtain complete control over its gathering-grounds an authority must generally purchase them; but land suitable for collecting surface water is usually of little value for cultivation purposes. Uplands having any mineral value are usually unsuitable for collecting water, since exploitation would generally cause access of workers.

The author's conclusions are: (1) Filtration of unpolluted water is unnecessary as a protection against disease. (2) Filtration of polluted water, even when well conducted, is not always an absolute safeguard against disease. (3) To make filtration efficient, within the limits of the possible, constant skilled and scientific supervision and provision against possible breakdowns are needed. Efficient filtration involves a considerable initial and permanent expenditure. (4) Protection against pollution is a sufficient safeguard against disease. (5) The initial expenditure caused by the acquisition and depopulation of gathering-grounds varies, and in some districts may be considerable; but this is not usually the case. (6) The supervision of depopulated gathering-grounds requires no special skill, and may be carried out efficiently with a small permanent expenditure. (7) When expense is not a matter for consideration, the best results are obtained by a combination of protection with well conducted filtration; but whenever expenditure makes it a matter of necessity to choose between filtration and protection, I have no hesitation in saying that protection is better than filtration, which is really equivalent to saying that "prevention is better than cure."

Discussion.

The PRESIDENT (Mr. R. H. Swindlehurst), in proposing a hearty vote of thanks to Professor Delépine, said he was personally much indebted to him for having prepared the paper.

Mr. G. HODSON (Loughborough), admitting that there was a great deal of useful information in the paper, said there were many of the author's conclusions with which he did not agree. His remarks applied chiefly to moorland watersheds in northern parts of the country; but practically the whole of them, so far as the protection of watersheds went, would be useless when applied further south. It would be a matter of utter impossibility down south to acquire the whole of the watersheds; and he (Mr. Hodson) maintained it would be quite unnecessary. The Professor himself, in discussing the practical result of efficient sand filtration of Thames water (in some cases it was double filtration), showed that the water was delivered to London in a state that would not create any organic disease; nor had a Royal Commission or any other observers been able to trace to the supply of London water a distinct case of typhoid. He agreed that prevention was better than cure; and, in his further remarks, he said that, where a watershed could be acquired at reasonable cost, then it would be worth while for a local authority to buy it. But it would be impossible, as the experience of all water engineers present showed, to take the precautionary measures proposed by the author. Beyond this, he stated his opinion that a great many of these measures were practically unnecessary; and the corporations throughout the country need not seriously consider them. Referring to the question of moorland water, he said it was certainly a good thing to filter the water. Liverpool and Birmingham had found that the best position for the filter-beds was as close to the moorland gathering-ground as possible; otherwise there was trouble with the accumulation of bacteria in the pipes. Speaking of the variation in the numbers of bacteria in water, he stated that some years since, Professor Frankland was astonished to find that, all through the wet months, he got enormously larger quantities of bacteria in water than during the dry months; and he (Mr. Hodson) then suggested to him that the excess of bacteria was merely the living organisms that were washed out of the soil in the wet months. He believed Professor Frankland became quite converted to this idea. He had himself long since come to the conclusion that, where they could manage to get water percolating through a fair thickness of soil, it really did improve its quality. In the richer ground that they had down south, there must be an enormously greater number of bacteria than were to be found in sterile soils; and naturally there they must look for more bacteria in the waters they had to deal with. But it did not follow that, because there were more bacteria, they were bacteria that need be dreaded. He also spoke of the increasing difficulties of supplying the growing populations owing to the absorption of the watersheds. He believed that in

the future filtration would be the sheet-anchor on which water-works engineers would have to rely. Sooner or later—the best of the watersheds having been taken up—the question would be where were they to get the water from. If the Rivers Pollution Board looked after their duties in the way it was hoped they would, in many districts they would again be able to resort to the rivers and to some method of treating the water, and making it fit for consumption. He thought it would be very wrong to allow it to go out through the Press that water engineers considered the actual purchase of watersheds and their depopulation necessary, because, in his opinion, Science had a great deal more to say on the question; and it was unnecessary to alarm the public and the local authorities generally. However, he had pleasure in seconding the motion.

The motion was unanimously passed; and the author acknowledged it.

Mr. C. H. PRIESTLEY (Cardiff), continuing the discussion, agreed with Mr. Hodson in his remarks as to the purchase of gathering-grounds. As engineers, they knew very well that in many towns it was practically impossible, owing to the cost, to recommend that this should be done. In his own case, he had one gathering area of upwards of 4000 acres, with only one house upon it, and there was no likelihood of any other house being built upon it. He had not thought it necessary to recommend his Council to buy up such a gathering-ground as that, where it was impossible, or very nearly so, to have any contamination flowing into the streams. Professors often looked at these matters from a purely scientific point of view; the engineer had to consider to a great extent the cost of what he was going to propose. Scientific men seldom considered the cost; but engineers knew that were they to propose many of the suggestions that came from professors, their committees would simply say they were asking for something which it was quite impossible to carry out, owing to the limited means at their disposal. Therefore they must look to other means—such as filtration—to supply the purest water in the future, even from contaminated sources. Directing attention to a paper recently read by Mr. W. Whitaker on the shortage of water supply in this country, he said he thought the point raised in it had been missed by many engineers—especially leading consulting engineers—that, at comparatively little cost, they might utilize, to a great extent, the natural rivers that ran throughout the country for every purpose, excepting perhaps dietetic. In some towns the water employed for trade purposes was different from that used for domestic supply; and, as time went on, this second supply was likely to increase. They would also in the future have to look to some other means of providing the large amount of water required for sanitary purposes, &c.; and duplicate supplies would be the question that every engineer would without doubt have to consider. While he agreed that many of the Professor's proposals were good, he questioned the wisdom of the idea (if this was the author's meaning) of diverting storm water to waste; and as to tramps, it would mean a very great expense—more than most corporations could go to—to have the whole of the gathering-grounds patrolled as they should be every day to keep the water free from contamination from this source. As to Mr. Hodson's point regarding filter-beds being immediately below the gathering-grounds, his experience was directly opposed to that of Mr. Parry, of Liverpool. He (Mr. Priestley) did not find the incrustation of pipes vary at all with water before or after filtration.

Mr. W. WATTS (Sheffield) remarked that those of the members who were connected with gravitation schemes knew that floods only came a few times in a year. When they did come, the volume of water was very great; and they could not afford to lose it. It could be easily diverted into compensation reservoirs if the necessary provision were made. There was no doubt whatever that the normal flow of moorland streams was pure water; and if they could separate it from the flood water by diverting it into the reservoirs used for domestic purposes, it was the right and proper thing to do. If water was carefully collected in this way, filtration was very materially assisted, and probably not necessary at all. As to the purchase of moorland areas, he did not think the upper reaches need be purchased; but, if it was thought proper, they could be at a very reasonable price. He had been told by the Umpire engaged in the matter that, after forty or fifty years, the Liverpool people had seen that it was necessary to purchase the whole of the Rivington drainage area. It was very essential that cattle should be kept away from streams. One way of getting pure water was to have as many precipitating reservoirs as possible. In collecting the flood waters, the reservoir should be used with very great discretion—that was, by taking care to always have it as empty, or as nearly so, as they possibly could to receive the floods; then decant first of all the upper few feet, and then the lower few feet, so that the water got purified at the surface. With reference to moorland areas, he was a great believer in draining the extensive peat beds that existed there, as this in a large measure prevented the acidity of the water. As to what had been said about Liverpool, he was under the impression that the pipes between Oswestry and Vyrnwy were on a dead level; and in that case were practically part of the reservoir itself. He should naturally expect in a case like this that there would be bacteria and other matter adhering to the surface of the pipes, because there was practically no friction there. He was a firm believer in having the water filtered as near the town as possible.

Mr. A. J. PRICE (Lytham) observed that the author himself showed that filtration was very useful, as in one part of the paper he pointed out that water flowing through 18 inches of soil had practically the whole of the bacteria removed from it. Later in the paper, he gave a number of instances in which filtration had failed. These cases all occurred eight, nine, or more years ago; and at the time these epidemics took place, filtration was hardly understood. It was looked upon then as a mechanical straining, instead of being a bacterial operation. The speaker cited cases to prove that filtration could be thoroughly relied upon. He had had experience of a river-polluted supply. At Worcester, about 1894, there were a great number of typhoid cases; but, by means of filtration, they were able to get rid of the whole of the typhoid in the district. There were many places in this country where it was absolutely necessary to rely on a river supply. He believed there were now fewer cases of typhoid from river supplies than from upland surface and well water. Typhoid fever of late years had been proved to be from deep-well waters, or from springs. He also thought it was much cheaper to put down filters than to go on purchasing large gathering-grounds. Contamination also took place from storing filtered water in uncovered reservoirs; and, in the case of river and well supplies, they should not be allowed to see the light until they reached the consumers' taps.

Mr. W. WHITAKER (Croydon) called attention to a remark in one part of the paper which seemed to suggest that filtration in the case instanced had done harm. He had no doubt that this was the case, either through the method of, or inefficiency in the method of, filtration. They knew what happened in the case of the domestic filter; and it seemed to him that a similar result might occur on a large scale. There must be exceptions to the rule that filtration was good in many cases. The question of tramps on watershed areas was a serious one. But the author, immediately after calling attention to this, said that constant skilled supervision was unnecessary, after taking all the precautions advised. He (Mr. Whitaker) thought that the supervision ought to be fairly frequent, and not merely casual. He did not think they would ever get an absolute rule in public work or private life, and be sure that it would also do and always act. But if they had a precaution that acted in 95 cases out of 100, clearly it was a thing that it was wise to do; and when filtration could produce the results shown in the case of the London water supply (which was the great test case), then filtration was a good thing to apply to their water supplies. Though the purchase of gathering-grounds was proper, it was only within the reach of large corporations and those who were favourably placed. But where authorities could not buy their watersheds, there was another thing they could generally do, and that was get control over them. He must defend scientists from the very proper charge that Mr. Priestley brought against them—that in tendering advice they did not think much of the money. It was not their duty often to think of that. Generally, it was the duty of the scientist to put before his clients the worst possible state of things, and to show them the most they would have to do—not the least, because companies and corporations were very much addicted to cutting things down. The author had shown the members, who were practical men, the worst state of things. This was quite right; and it was the object he had in view when he started.

Professor DELÉPINE said the original title of his paper referred to "upland surface waters;" but those words were allowed to drop out. Therefore he agreed entirely with what Mr. Hodson said with regard to the difficulty of dealing with water in the lowlands in the way suggested. When he spoke of the diversion of water, he did not mean to lose the water, but simply to divert storm water from the service reservoirs. The storm water could be diverted for compensation or sedimentation. He was glad to have the support of Mr. Whitaker as to the scientist. He knew quite well the difference between the practical engineer and the man who had to give a kind of statement as to an ideal state of things. He knew in many cases it was impossible to purchase gathering-grounds. But he knew it was possible to purchase rights for protection; and the time had come for all to give consideration to the question of the purchase of such rights.

Goole Gas and Water Supply.—In the "JOURNAL" for the 28th ult., we gave some statistics relating to the working of the gas and water undertakings of the Goole Urban District Council in the financial year ending the 31st of March. At the meeting of the Council at which this matter was under consideration, the Clerk (Mr. J. W. Johnson) presented a long report on the accounts of the two departments, which showed that the Council are in possession of valuable assets in their gas and water works. The amount expended on the two concerns up to March 31 last, was £111,305 10s. 1d. During last year, the outlay on the gas division was £3016 14s. 5d., and on the water division £12,655 3s. 9d.—together, £15,671 18s. 2d.; thus increasing the expenditure to £126,977 8s. 3d. The amount outstanding on loan account at the end of the financial year was £103,517 1s. 3d. The accumulated profits from 1893 up to and including the year lately closed amount to £9741; but from them the Gas and Water Committee have deducted £3731 and a sum of £822 on account of a revaluation abatement on sundry stores—leaving a balance of £5188. As already mentioned, the profits last year were more than sufficient to meet the interest and the repayment of the principal. Mr. Johnson and the Manager (Mr. T. E. Franklin) were complimented on the results of their combined labours.

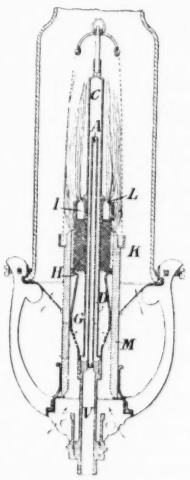
REGISTER OF PATENTS.

Extracting Valuable Products from the Spent Lime of Gas-Works.—Tcherniac, J., of Freiburg-in-Breisgau, Germany. No. 16,461; July 24, 1902.

This invention, relating to the treatment of lime which has been used for purifying coal gas, has for its object to obtain useful products therefrom. The spent lime—a mixture of various compounds of calcium, among which are calcium sulphocyanide and calcium hyposulphite or thiosulphate—is "leached" with water by any known method, and preferably systematically, so as to obtain a solution as concentrated as possible. After separating the undissolved matter from the solution, the latter is evaporated to dryness at 100° to 110° C., and kept for some time at this temperature, whereupon the calcium hyposulphite is decomposed into products which are insoluble. The mixture is treated with cold water, which dissolves the calcium sulphocyanide, while the residue may be treated with an alkali, alkali carbonate, alkali sulphate, or the like to obtain an alkali thiosulphate. By conducting the evaporation at a low temperature, as in a vacuum, the calcium hyposulphite is not decomposed but may be crystallized while the calcium sulphocyanide remains in solution.

Gas-Burners.—Lamure, P., and Megè, P. E., of Bois Colombes, France. No. 16,643; July 26, 1902. Date claimed under International Convention, Dec. 6, 1901.

This burner (of the bunsen type, adapted for illuminating purposes with incandescent mantles, and for heating) is "characterized" by the fact that the gas before it is mixed with air passes into a chamber at the centre of the flame, where it is raised to a high temperature, and also by the fact that it produces two concentric flames.



As shown, it consists essentially of three parts: 1. A heating-chamber arranged at the centre of the flame, and in which the gas is conducted before it is mixed with the air, so as to produce the combustible mixture. 2. A mixing-chamber which the heated gas enters on leaving the heating-chamber. 3. A chamber for the expansion and superheating of the gaseous mixture, upon issuing from which it is ignited

The gas is conducted through the supply pipe into the heating-chamber C by way of the inner tube A fixed to the pipe V connected to the supply pipe. The chamber C consists of a tube closed at its upper portion and arranged in the centre of the flame. The gas-tube A rises to the upper portion of the Chamber, which descends concentrically with this latter down to the base of the appliance. The gas heated in the chamber descends into the annular space between the chamber and tube, and escapes at the base of the tube through small orifices. The admission of gas into the heating-chamber is limited by a diaphragm arranged at the lower part of the tube. The maximum effect is obtained when the quantity of gas introduced into the heating-chamber through the diaphragm (regard being had to the expansion) is sufficient to produce complete incandescence of the mantle.

The heated gas, on escaping, enters a mixing and expansion-chamber, consisting of a wall in the form of a truncated cone flaring upwardly, and joined to a truncated conical wall G flaring downwardly. This latter is joined to a third truncated conical wall H flaring upwardly. The wall is provided with orifices through which the air intended to mix with the gas issuing from the orifices of the heating-chamber C is admitted. Upon contact with the entering air (the temperature of which is lower), the gas experiences a contraction which assists the mixture of the two fluids; and the air is carried along by the gas which escapes from the orifices with great velocity. The gaseous mixture engages in the expansion-chamber, "where it becomes perfectly homogeneous, and the various parts of the fluid stream assume an equal velocity."

On leaving the expansion-chamber, the mixture engages in a cage of metallic gauze K, through which it passes into an annular chamber I, from which the gas escapes through a crown of metallic gauze L, which constitutes the ignition point. The whole constituted by the chamber G D and the cage K is arranged in a large tube M, which is preferably formed of a substance which is a bad conductor of heat—such as refractory earth, porcelain, steatite, or the like. The upper portion of the tube M terminates a little below the annular chamber I in such a manner as to uncover a small part of the height of the cage K. The combustible mixture also escapes at this point—thus forming a second flame concentric with that formed at L. The portion of the gaseous mixture forming the flame at L is superheated in the chamber I, which ensures perfect combustion.

Manufacture of Incandescent Mantles.—Terrell, T., K.C., of New Court, Temple. No. 20,004; Sept. 12, 1902.

In the manufacture of mantles for incandescent gas lighting, according to some methods, the pantentee points out, a thread of organic material—such as cotton or artificial cellulose silk—is impregnated with the salts of certain rare earths; and this thread is then knitted by machinery into a long tube, which is cut up to the lengths necessary for mantles. Difficulties have arisen in connection with this branch of the manufacture (particularly where artificial silk is used) owing to the elasticity of the thread causing it to attempt to straighten itself when knitted; this tendency making the tube irregular in shape and not of uniform diameter. The present invention therefore relates to means of overcoming this disadvantage; and it has for its object the rendering of the tube uniform throughout, and causing the thread to conform to its newly acquired loops, by treating it before knitting with a solution of paraffin in benzene (in order to waterproof it), and, when knitted, winding the knitted tube, like a flat bandage, on to a drum or reel, consisting of a hollow, perforated metal cylinder with wide perforated metal flanges—the tension of the tube being adjusted so that its width exactly fits between the flanges, which act both as a gauge and to retain the tube upon the cylinder.

Gas-Engines.—Casey, A. & P. A., of Paddington, W. No. 24,195; Nov. 5, 1902.

The patentees' proposal is to construct a vertical cylinder with a circular air-tight chamber at its base—termed the "crank-chamber," as in it is placed the crank-shaft working in proper bearings. The ends of the shaft pass out on each side of the chamber in order to receive a pulley or driving wheel. The crank-chamber is provided with flanges across its centre, and is held together by bolts and nuts. In the top half of the chamber is provided a valve through which the explosive mixture is drawn when the piston is running up. The crank is connected by a rod to the piston, which works in the vertical cylinder, provided with a side port through which the exhaust is ejected. On the top of the piston is a delivery valve, through which the compressed mixture passes from the crank-chamber into the explosive chamber of the cylinder when the piston is down below the side port. At the top of the cylinder is a flange, to which is fixed a cover, and to the cover is fitted a vertical plug for making and breaking contact with the top of the pistor. from a primary circuit. In the cover is a sparking-plug, which ignites the charge in the explosive-chamber on full compression being attained.

Lighting and Extinguishing Gas-Jets from a Distance.—Canellopoulos, J. M., of Paris. No. 3455; Feb. 13, 1903.

In patent No. 17,791 of 1902 [see "JOURNAL," Jan. 6 last], the patentee described an arrangement for automatically lighting gas-jets, wherein, upon the opening of the tap controlling the jet, the gas is automatically ignited. In order, however, to adapt this system for use in towns, he says it is necessary to supplement it by an arrangement whereby the manipulation of each tap at the moment of lighting or extinction may be dispensed with, and the gas-jets of an entire district ignited or extinguished from a distant point. His present invention therefore has for its object to enable the turning on and off of the burners to be effected by means of variations of pressure in the gas-pipes by which the burners are supplied.

An example of apparatus in accordance with this invention, arranged below the burner, is shown. Fig. 1 is a section and plan of the entire apparatus; and fig. 2 is a section of the apparatus without the membrane.

The apparatus comprises an elastic membrane A of metal, or of tissue impregnated with collodion. It has the form of a truncated

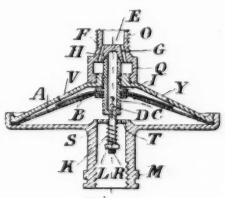


Fig. 1.

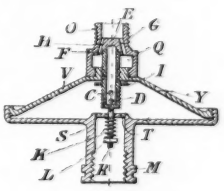
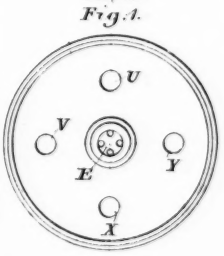


Fig. 2.



cone; and at its lower and circular edge, it is firmly held between the upper and lower parts of a chamber in which it can move. At its upper part, the membrane is held in position by a support B, which is fixed to a hollow valve F provided at C and D with holes that enable the lower part of the chamber of the diaphragm to communicate with the interior of the valve F. The seating of the valve is located at E, while at G and H there are placed two passages causing the inner chamber Q to communicate with the burner. The membrane is pressed downwards by a spring K, whose stress can be modified by the nut L in order to regulate the governing of the burner to a determined pressure of gas. The lower part of the chamber has a tubular extension M communicating with the chamber below the membrane by two orifices S and T. The cover L is provided with holes U, V, X, Y, through which the atmospheric pressure acts upon the membrane.

The apparatus being set up, the gas passes through the orifices S and T, and reaches the portion of the chamber below the membrane. If the pressure of the gas upon its lower surface is greater than the pressure of the spring K together with that of the atmosphere, the membrane rises and forces the valve F against its seating E, and thus prevents gas entering the inner chamber Q. If, on the contrary, the pressure exerted by the gas on the lower surface of the membrane is less than the sum total of the two pressures, the valve remains open, allowing the gas to pass into the chamber Q, and thence to the burner, where it becomes ignited by the automatic lighting device described in the 1902 patent.

If all the burners on the public roads were provided with the apparatus, it would, says the patentee, be possible to light and put them all out at a distance—from the gas-works for instance. If the maximum pressure of the gas were 50 millimetres of water, the spring K would be adjusted in each apparatus in such a way that, while the pressure did

not exceed a maximum of 50 millimetres, the membrane A would not be operated. All the burners could then be lighted if the pressure were between 0 and 50 millimetres of water. If it were desired to turn out the burners in the town, it would suffice to gradually increase the pressure of gas to 60 millimetres, for example. Directly this excess of pressure was obtained, all the membranes would rise and lift the valves, which, by bearing against their respective seatings, would prevent gas from reaching the burners. If it were desired to relight the jets, it would suffice to reduce the pressure below 50 millimetres. The springs K would then cause the membranes to return to the position for opening, and the burners be lit automatically.

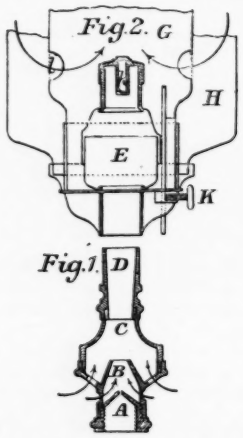
Gas-Stoves.—Mills. J. B. : a communication from "Secretary," a corporation organized under the laws of the State of New York. No. 8680; April 16, 1903.

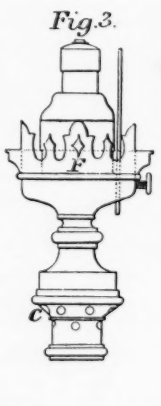
The patentees' propose constructing the heating parts of the stove of ball-like or cylindrical formation—that is, providing an inner ball or cylinder of some fire-proof material (for instance, metal, clay, or the like), and surrounding it with a globe or cylinder of "foraminous" material—preferably an asbestos fabric that can be heated to the proper condition. In this way, a combustion chamber is formed between the ball and globe and the two cylinders; and the gases are admitted to the chamber through a bunsen burner covered by any suitable mantle and provided with gas outlets interjacent to the ball and globe and cylinders. The burning gases in the chamber completely envelop the ball and heat the foraminous globe, from which the heat is effectually radiated.

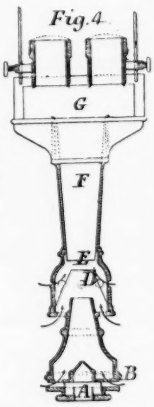
Incandescence Gas-Burners.—Hubert, C., of Paris. No. 9143; April 22, 1903. Date claimed under International Convention, April 23, 1902.

This invention consists of: (1) An arrangement for utilizing the heat produced by incandescence gas-burners for preheating the air and gaseous mixture supplied to the burners; (2) the use of one or more incandescence mantles arranged on the same burner; (3) superposed air-chambers in which the gas is intimately and gradually mixed with a suitable quantity of air.

Each apparatus consists of an injector or nozzle A, at the base of the apparatus; a conical part B, facilitating the flow of the gas and air; chambers D and C, of conical shape, wherein the mixture of air and gas is effected; a preheating chamber E; a burner K; and two concentric chimneys G and H, of glass or mica, between which the air is highly heated before being used for combustion.







The air is drawn in, in parallel layers through circular apertures, by the force of the gas entering by the injector, and mixes intimately with the gas in the chambers B and C. The part shown in fig. 2 fits accurately the upper portion of the chamber D, shown in fig. 1; and these parts, when connected, form the apparatus shown (drawn to a smaller scale) in fig. 3. In this arrangement, the mixture of gas and air enters the chamber E, and impinges against a metal grate or wire gauze, which effects a further commingling of the gaseous elements; the mixture being highly heated by its contact with the walls of the chamber. A second grate or wire gauze is placed at the top of the burner, to prevent the flame back-firing.

A gallery F carries a glass chimney G provided with holes, and on the closed base of this gallery rests a second glass chimney H, the height of which is less than that of the chimney G. The preheating chamber E, for the mixture of gas and air, is entirely surrounded by the chimney G, and forms the part where the greatest heat is developed.

The burner is supplied with air only through the holes provided in the glass chimney G. The air required for combustion flows in the direction shown by the arrows, passes between the concentric chimneys G H, and becomes highly heated as it comes in contact with them.

The arrangement named can only be used for apparatus of small or average consumption of gas, and is not suitable for large burners of high illuminating power, as the great volume of air and gas required necessitates a more perfect mixing. Fig. 4 shows a burner provided with three superposed mixing-chambers C, D, E. Gas enters the apparatus through the nozzle A, passes successively through the three conical chambers C, D, and E, each of which supplies a current of air drawn in (as shown by the arrows) by the rising column of gas. Each series of arrows corresponds to groups of circular orifices provided on the base B and around the chamber C. The currents of air enter the apparatus through holes provided in the walls of the chamber E. The gaseous mixture expands in the flaring conical part F, and then reaches the preheating chamber G. Above this chamber G are arranged one or more burners, each of which is provided with a wire gauze diaphragm to complete the commingling of the gaseous elements. Each burner is fitted with a mantle of comparatively small dimensions, "as practice has demonstrated that small mantles are more incandescent and last a longer time than do mantles of large size."

Compressing and Mixing Air and Gas and Supplying it to Atmospheric Lighting and Heating Burners.—Hinman, C. W., of Charlestown, Mass., U.S.A. No. 10,186; May 5, 1903.

This invention has for its object the production of an incandescent gas lighting or heating system by which the ordinary standard sized gas-pipes may be used. A non-explosive mixture of air and gas is produced and carried by the system of piping to a burner having air inlets at the bottom, and delivered at a velocity such that additional air will be drawn in through the openings at the bottom of the burner in sufficient quantity to effect complete combustion, and, preferably, at a velocity whereby a short intense flame—similar to a blow-pipe flame—will be produced. Ordinary illuminating or city gas is to be employed; also means (as, for instance, a suitable valve) for regulating the delivery of air and gas from the pump to the holder, which is controlled or operated by the volume of mixed air and gas in the holder.

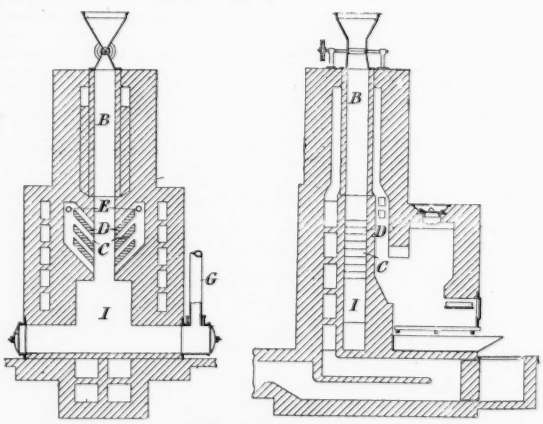
Compressing Gas and Supplying it to Atmospheric Lighting and Heating Burners.—Hinman, C. W., of Charlestown, Mass., U.S.A. No. 10,189; May 5, 1903.

This invention relates to incandescent gas lighting and heating apparatus, and has for its object to construct an apparatus adapted to increase the pressure of illuminating gas from normal to abnormal—as, for instance, from 3 inches or thereabouts to 6 or 8 inches—and to deliver the gas under such increased pressure to a burner having air inlets at the bottom, and, for lighting purposes, bearing a refractory mantle. The increased pressure results in giving the gas issuing from the burner a velocity whereby a large amount of air is drawn in at the bottom of the burner, and a short intense flame is produced, similar to a blow-pipe flame; and, in the case of a burner bearing a mantle, the candle power of the light produced is materially augmented.

The invention consists essentially in the combination of a burner having air inlets at the bottom, and, for lighting purposes, bearing a refractory mantle; a pipe leading thereto; a holder from which the pipe leads, having a pressure-device whereby the gas is delivered at a constant "blow-pipe" pressure; a pump for delivering the gas to the holder, having a pressure-device greater than the pressure-device of the holder; means for operating the pump; and a pipe connecting the pump with a supply of illuminating gas.

Manufacturing Water Gas or Mixed Gases.—Horn, G., of Braunschweig, Germany. No. 12,182; May 28, 1903.

This invention relates to the continuous manufacture of water gas or mixed gas by heating coke, coal, or other solid or liquid carbonaceous material and steam in externally heated chambers, separate from each other, and then bringing the heated steam and coke or other material into contact with each other. The patentee says it is preferable to proceed in such a manner that "the coal or coke dust or other carbonaceous material is allowed to fall through a vertical retort heated from the outside; the particles of coal or coke thus heated being brought immediately into contact, in a decomposing chamber connected to the retort, with highly heated steam. The pure water gas, or (when using coal dust) water gas mixed with the gaseous products, is preferably again led through a heated chamber filled with coke, whereby any excess of steam present is decomposed."



In the sections given of the arrangement of plant, underneath the vertical retort B is a decomposing chamber C, preferably provided on two opposite sides with inclined plates D. The inlet pipes E admit steam into the chamber at the rear of these plates. The furnace widens at I; and below is a passage running across the whole width of the furnace, the ends of which are closed by lids or covers, one of which is provided with an outlet pipe G. Flues are led from the grate of the furnace in such a manner as to heat the retort, the decomposing chamber, and the heating chamber.

In order to manufacture pure water gas, coke in powder or dust is fed into the retort from a hopper above, and the particles of coke, in falling in a thin cloud through the heated retort, are heated to a high degree. This highly-heated coke dust then reaches the decomposing chamber C, into which steam is led at low velocity through the pipes E. The steam is superheated by its passage between the hot plates D, so that the highly-heated particles of coke and the superheated steam meet in the chamber C, whereby decomposition of the steam, with the formation of water gas, is effected, "under the most suitable conditions possible." The water gas thus produced passes into the lowest highly-heated chamber I; and any excess of steam which may be present is decomposed by the mass of coke in the chamber, and is sucked through the pipe G by an exhauster and led into a receiver.

In place of coke dust, coal dust or other solid or liquid carbonaceous material may be fed into the retorts. In this case, the material used will be distilled in the retorts B—that is to say, gas will be evolved from it direct, and therefore a mixed gas, and not pure water gas, is obtained.

Gas-Engines.—Arnold, E. E., of Pittsburg, U.S.A. No. 12,565; June 3, 1903. Date claimed under International Convention, June 4, 1902.

This invention has for one of its objects to provide an engine which shall have improved means for controlling each set of inlet and exhaust valves, through a system of levers, by the action of a single cam when the engine is operating normally with an explosive mixture, and also simple and adjustable means for operating part of the engine as an air-motor while starting. A further object is to provide means for adjusting the time of opening the explosive mixture inlet valves relative to their respective exhaust valves, and also to render certain of the inlet valves inoperative during the time that compressed air is utilized for starting the engine.

Freeing Gases from Carbon Disulphide.—Töhl A., of Hoenningen-on-the-Rhine, Germany. No. 13,466; June 16, 1903.

In the ordinary scrubbing processes employed in gas-works, illuminating or heating gas is, the patentee points out, freed from sulphuretted hydrogen; but the gas obtained is not free from sulphur. The sulphur constituent of the purified gas is caused by the presence of carbon disulphide, which "cannot be removed by known purifying processes." But a means has been discovered, he says, for freeing gases of all kinds from carbon disulphide vapour, consisting in submitting the gas—either before or after it undergoes the ordinary purifying process to which it is submitted in gas-works for removing the various impurities—to a further washing with a washing medium which completely absorbs the carbon disulphide; any convenient form of scrubber being employed for this purpose. The substance "which produces this result of completely absorbing the carbon disulphide from gas, without detrimentally affecting either its illuminating or heating properties," is the oily constituent of the products resulting from the distillation of vinasse. This oil is obtained, together with an aqueous solution when vinasse (that is to say, the residual liquid which remains when sugar is removed from beet sugar molasses by fermentation or by any desaccharifying process—for instance, by means of barium oxide, strontium oxide, or calcium oxide), is submitted to distillation. The vinasse is heated for obtaining the oil, so that dry distillation is effected. The distillation may take place, for example, over an open fire in retorts; and the distillation products are condensed and collected. An oil and an aqueous liquid are obtained, which are separated by pouring off the oil floating on the water. The oil, when dried, presents the property of absorbing large quantities of disulphide; and by heating, either with or without simultaneous introduction of steam, the oil, previously used, may be again rendered suitable for absorbing carbon disulphide from gas.

APPLICATIONS FOR LETTERS PATENT.

16,461.—Griffiths, H. E., and Clay, J., "Internal combustion engines." July 27.
16,485.—Hebebrand, A., "The method of decreasing the percentage of sulphocyanic compounds in gas phosphate." July 27.
16,497.—Woodall, H. W., and Duckham, A. M'D., "Manufacture of gas." July 27.
16,550.—Gibbons, W. P., and Goodes, W. G., "Charging gas-retorts." July 28.
16,610-1.—Schöne, L., "Gas cooking-apparatus." July 28.
16,617.—Beard, R. R., "Incandescent burners." July 28.
16,626.—Hurst, C., "Gas-dynamos." July 29.
16,633.—Musker, A, "Charging gas-retorts." July 29.
16,640.—Ryland, T. J. F., "Incandescent burners." July 29.
16,641.—Catchpole, F. E. & E. A., "Purification of naphthalene and anthracene." July 29.
16,715.—Rocholl, H. C., "Incandescent gas and other burners." July 30.
16,719.—Bray, J. W., "Gas-cocks." July 30.
16,739.—Shaw, E. J., "Pendants for inverted mantle lamps." July 30.
16,764.—Dempster, R., "Gas-generator." July 30.
16,766.—Mucke, G., and Krueger, O., "Burning off incandescence mantles." July 30.
16,772.—Smith, H., and Wright, B. F., "Internal combustion motors." July 30.
16,843.—Scholes, W., and the National Gas-Engine Company, Ltd., "Internal combustion engines." July 31.
16,853.—Welsbach, C. F. Auer von, "Manufacture of metallic alloys having pyrophoric action, and their application to the purposes of ignition and illumination." July 31.
16,885.—Warwick, F., and Main, D. D., "Contrivance for giving a continuous supply of hot water to any gas-cooker or stove without any extra consumption of gas." Aug. 1.

CORRESPONDENCE.

[*We are not responsible for opinions expressed by Correspondents.*]

Lord Avebury on Municipal Trading.

Sir,—My attention has been called to a statement in the article under the above heading which appeared in the last issue of the "Journal," as follows: "Apart, however, from the question of price, is that of quality. Lord Avebury expresses his indebtedness to Sir George Livesey for information on this point, to the effect that in Manchester the gas is of 19-candle power, whereas in Liverpool it is 20 candles, while the latter gas is so much more rigidly tested than the former that the difference is really equivalent to 3 candles."

It is difficult to understand why Sir George Livesey should make such a statement as this, because he knows that Liverpool does not possess any superior means of testing gas to other large towns; and I refuse to believe that Sir George would cast any reflection upon Manchester.

I must emphatically dispute the assertion that either Liverpool gas or that of any other town is more rigidly tested, or more fairly tested, than that of Manchester. At each of the three works, there is a competent Chemist, whose principal duty is to test the gas—both for illuminating power and purity; and the instructions are to return the average illuminating power of the gas distributed from the works during the twenty-four hours. The means adopted to ensure that these tests represent the true value of the gas distributed are most complete, and could not be more complete by whomsoever they were made.

Any statements which are either unfair, unjust, or at variance with the truth, will not help to a proper solution of the question as to whether municipal or private enterprise is the best.

Robert Gibson, Chairman.
Gas Department, Town Hall, Manchester, Aug. 8, 1903. Corporation Gas Committee.

The Beanfeast Nuisance.

Sir,—I must ask you to kindly correct an impression which, I fear, has been conveyed by your article in last Tuesday's "Journal," as to the attitude this Company have invariably taken in regard to any of the officers or workmen soliciting subscriptions from traders or others towards the men's outings.

While believing, as I do, that friendly gatherings (the expenses of which are wholly contributed by the men themselves) are conducive of much good by the social business relations which they promote, the instructions you allude to form no new departure whatever, but are simply a repetition of similar instructions issued by myself, and which have been in force for many years past.

So long, however, as the Government postpone dealing with this important matter, no action on the part of gas companies and others—which I unhesitatingly state has always been in the direction indicated, so far as my Company are concerned—can have its full effect.

G. F. L. Foulger,
The Gaslight and Coke Company, Goswell Road, E.C., Aug. 7, 1903. Distributing Engineer.

[Whatever may have been the instructions issued by our esteemed correspondent in years past, in relation to the matters about which he writes, it is clear—from particulars in our possession—that the orders have been more honoured in their breach than in their observance. It is to be hoped the new Chief Officer will be able to enforce strict obedience to his commands.—Ed. J. G. L.]

Sulphur Purification.

Sir,—In Mr. Greville's succinct and clear description of my process, as worked at the Commercial Gas-Works for many years and as described in my paper to the Institution of Civil Engineers in 1880, he very rightly approves the extraction of the impurities in the progression of: First, carbonic acid; secondly, sulphuretted hydrogen; thirdly, bisulphide of carbon; and, lastly, the stains of sulphuretted hydrogen again imported into previously pure gas by the bisulphide of carbon purifiers. But practical gas managers and gas engineers—as opposed to chemists—will not agree in his conclusion that this is better than a rotation of five purifiers, for the following important reasons, which it is my duty to point out, as I have lately addressed the Gas Referees on the very question of the difficulties surrounding sulphur purification—specially hard on single as compared with multiple gas-works.

In the first place, such a magazine of sulphur as the separate bisulphide of carbon purifiers become after some months of use, constitutes a grave peril of not merely an excess of a few grains in the effluent gas, but of hundreds of grains. Mr. Greville will recollect that this happened once or twice—not from any chemical default in the antecedent purifiers, but from the leakages of valves and the failures of metal diaphragms which allow a small proportion of gas to leak by, containing carbonic acid.

This danger, and the further great difficulty of meeting the sulphuretted hydrogen tests on gas, which under the system Mr. Greville describes is made absolutely free from sulphuretted hydrogen and then again polluted by the sulphide of calcium purifiers, though only to a trivial degree (a bare stain—yet on that account all the more difficult to eradicate), are considerations which, together with the enormous back-pressure in working not less than seven or eight purifiers in rotation, weighed with me, and will weigh with every practical engineer, in bringing back the purification to a rotation of five vessels in sequence, where the final vessel is always a freshly-charged check (no small consideration) on the sulphuretted hydrogen stains.

Before concluding this letter, I would like to add that the difficulty of the sulphuretted hydrogen stains, and specially on water gas, has been a matter of very great expense wherever the tests as applied by the London County Council are current.

I am in the position of controlling gas undertakings where such tests are not made, and where the purification of the water gas, like that of the coal gas, is accomplished at a fraction of the cost in London.

Palace Chambers, S.W., Aug. 6, 1903. HY. E. JONES.

PARLIAMENTARY INTELLIGENCE.

HOUSE OF LORDS.

Thursday, Aug. 6.

Amendment of Standing Orders Relating to Private Business.

Their Lordships had under consideration to-day, and passed, the following amendments of the Standing Orders in regard to Private and Provisional Order Bills.

After Standing Order 25B, a new Order (25C), relating to the deposit of maps in the case of Bills conferring powers for taking a supply of water, was inserted as follows:—

Where, under the powers of any Bill, any water may be taken, collected, or impounded for the purpose of a water supply, the promoters shall, on or before the 30th of November, deposit at the Office of the Local Government Board, and also at the Office of the Clerk of the Parliaments, an Ordnance map on the scale of 6 inches to a mile, showing by a distinguishing mark the position of each reservoir, well, conduit, or other work proposed to be authorized by the Bill; and where the proposed source of supply is a river, stream, or lake, an Ordnance map on the scale of not less than 1 inch to a mile, showing by a clearly marked line the catchment area or gathering-ground from which the waters are derived. Where, under the powers of any Bill, it is proposed to supply with water any area not previously included within the promoters' limits of supply, the promoters shall similarly deposit an Ordnance map on the scale of 1 inch to a mile, showing respectively the existing limits of supply and the area proposed to be added thereto.

Standing Order 29, relating to the deposit of plans, sections, and books of reference with Town Clerks, &c., was amended in paragraph (*d*), so that in the case of a rural district not having a Parish Council the plans, &c., are to be deposited with the Chairman of the parish meeting and with the Clerk of the District Council.

In Standing Order 92, the time for presenting petitions praying to be heard against any Local or Provisional Order Bill originating in the Upper House was fixed at three o'clock in the afternoon, on or before the 19th of February, in the case of Local Bills, and in the cases of Provisional Order Confirmation Bills, or Bills presented on petition, on or before the seventh day after that on which the Bill has been read a second time.

The scope of Standing Order 105A, giving bodies representing particular trades authority to petition and be heard against a Railway Bill, was enlarged so as to apply to "any body of persons, corporate or unincorporate, sufficiently representing a particular trade, business, or interest" in any district to which the Bill relates.

Standing Order 105C, as amended, sets forth that where the Council of any Administrative County or County Borough, "or being a Joint Committee of Councils of Administrative Counties, or County Boroughs," petition against a Bill, alleging that such County or County Borough, or some part thereof, will be injuriously affected by the Bill, it shall be competent for the Select Committee to whom the Bill is referred, if they think fit, to hear such petitioners, or their counsel, agents, and witnesses, on such allegation, or any part thereof.

The only progress made with Private Bill business last week was the third reading of the Sheffield Corporation Bill on Monday. The next day, the Chairman of Committees informed the House that the promoters of the Crystal Palace District Gas Bill did not intend to proceed further with it.

POLICE AND SANITARY REGULATIONS BILLS.

Simplification of Procedure—Repayment of Municipal Loans.

The Select Committee of the House of Commons to whom were referred all Private Bills, promoted by municipal and other local authorities, containing powers relating to police or sanitary regulations, have made a special report upon their proceedings, which extended over 51 days; fourteen Bills originating in the Lower House and nine in the Upper having been considered. In dealing with the Bills, the Committee endeavoured to follow the most recent and approved precedents; and they suggest that their labours would be materially lessened, and a better co-ordination of local legislation secured, if a digest of police and sanitary clauses allowed in the Private Bills of the last five years were prepared by the departments concerned for the use of the Committee, and if with each Bill a statement were placed before them by the promoters, containing a reference to the precedents followed, and showing any deviation, verbal or otherwise, therefrom. They also suggest that many of these clauses might now be embodied in a "Local Authorities Clauses Act," and incorporated by reference (after evidence, if necessary), in similar Bills, which, they point out, would reduce the length of Bills of this class, effect a saving of expense to promoters, and ensure uniformity of legislation in the future.

By the order of the House appointing them, the Committee were empowered to divide their number, and apportion the Bills between two Committees. They did not find it necessary to do this, but they recommend that the power should be conferred on any similar Committee to be appointed in a subsequent session. They suggest that an effective division of their duties would be if one Committee were empowered to deal with all police and sanitary clauses, and the other with the remaining clauses of a Bill, especially those upon which petitioners appear by Counsel—in fact, the apportionment between the Committees should, they think, be by clauses and not by Bills. In this way the current of legislation on police and sanitary provisions would be a uniform one, and it would be possible for the representatives of the Public Departments concerned to give that constant attendance during the consideration of the clauses with which they are concerned which is impossible when two Bills, both containing such clauses, are under discussion in different rooms. The Committee believe that much time might be saved by adopting this course, while the objects for which the Committee are appointed would be fully attained.

The order of the House further provided that if the Committee considered that the clauses of any Bill referred to them (other than those containing police and sanitary regulations) were such as, having regard to the terms of reference, it was not necessary or advisable for them to deal with, they might at any time make a special report to the Committee of Selection to this effect, and this Committee should then refer the Bill to a Select Committee, who should consider these clauses and the preamble, and report the whole Bill to the House, specifying in their report which clauses had been considered by the Police and Sanitary Committee, and which by the Select Committee. This was done in the case of one Bill this session; and the convenience of the course was fully established. The Committee recommend that a similar provision should be inserted in any order constituting a similar Committee in future. The Committee further suggest that in such cases the Select Committee should deal with the estimates, and should determine the expenditure to be authorized in respect of the parts of the Bill referred to them; but that the Police and Sanitary Committee should settle the period and mode of repayment of any money authorized to be borrowed in respect thereof, the determination of which is governed by considerations which are not always before the Select Committee.

The Committee had before them the report of the Select Committee on the Repayment of Loans by Local Authorities, fully considered the recommendations contained therein, and endeavoured, as far as possible, to give effect to them. In connection with this subject, they draw attention to the period of five years which is now invariably allowed for the repayment of money borrowed for the costs of an Act promoted by a municipal or local authority. In the absence of any information as to the actual amount of such costs, the Committee are unwilling to alter this period. But it seems to them that in the case of a small and indigent local authority, promoting an opposed Bill, and seldom coming to Parliament, a limit of five years may impose a burden upon ratepayers very far in excess of that which may be caused by an unopposed Bill promoted by a wealthy corporation. In one case the period may be too short, in another much in excess of the requirements; and in the majority of cases the burden of the expenditure is not felt during the existence of the body which has incurred it.

In one Bill before them, the Committee did not give the usual borrowing powers for this purpose, as it appeared in evidence that the course pursued by the Corporation promoting the Bill under similar powers granted in five Acts obtained by them in the last six years was to obtain the requisite funds by an overdraft on their bankers, which they did not regard as an exercise of their statutory borrowing powers under those Acts, contending that the period limited for repayment by them did not commence to run until there had been a borrowing in the open market. The amount actually obtained in this way was £23,975 6s; and neither the borrowing on overdraft nor the repayments, amounting to £4500, appeared in any specific form in the borough accounts. On this point the Committee say:

It is obvious that if the view taken by the Corporation in question is correct, the period of repayment, both for borrowing sanctioned for this purpose and for other purposes, might be indefinitely postponed, and the intention of Parliament in fixing specific times for repayment of loans wholly defeated, while corporate indebtedness would only appear inferentially in the published accounts, and as part of an overdraft applicable to many and possibly temporary sources of expenditure. Your Committee recommend that the opinion of the Law Officers of the Crown should be taken upon the question whether or not the period of repayment under a clause in the ordinary form runs from the date of borrowing, by overdraft or otherwise; and, having regard to the circumstances disclosed in the Bill referred to, they would suggest that in all future Bills it should run from the date of the Act itself.

The Committee further remark that they frequently have occasion to doubt whether the extent of the financial burdens consequent upon the powers sought by Bills of this character have been sufficiently brought home to the knowledge of the ratepayers, whose sanction has to be obtained before they are promoted. In one case they found the preamble of a Bill not proved, mainly on this ground; and in announcing their decision, they also indicated that they would require such estimates of expenditure as a prudent owner would ask for before burdening his estate with a charge extending over a number of years. The Committee consider that much greater care should be exercised in the preparation of these Bills, and particularly that the extent of the powers existing under the public general law should be ascertained by promoters before they apply for special powers which in many cases are wholly unnecessary.

Success and Reduction in Price at Tottenham.—There will be much congratulation flowing at the next meeting of the Tottenham and Edmonton Gas Company upon the results of the past half-year's working. The increase in consumption was no less than 55,324,000 cubic feet, which was equal to 16·79 per cent.—a percentage which few other gas companies will be able to show an equal to in the suburbs of London. The Directors last Saturday decided upon a course of action which will induce a continuation of progress in this direction. From the reading of the meters at Christmas next, they have determined upon a reduction in the price to the ordinary consumers of 2d. per 1000 cubic feet—from 3s. to 2s. 10d., and to give the slot consumers an increase in the quantity of gas per penny—from 22 to 23 cubic feet, which is equivalent to 2d. reduction in price.

LEGAL INTELLIGENCE.

HOUSE OF LORDS.—Thursday, Aug. 6.

(*Before the* LORD CHANCELLOR *and Lords* MACNAGHTEN, SHAND, ROBERTSON, *and* LINDLEY.)

Colliery Workings under Reservoirs.

To-day their Lordships gave judgment in an appeal from a decision of the Court of Appeal reversing one given in the King's Bench Division by Justices Ridley and Phillimore, on May 22, 1901, as reported in the "JOURNAL" at the time, in the case of *Bwllfa and Merthyr Dare Steam Collieries, Limited, v. Pontypridd Water Company.*

The question turned upon the construction of the Lands Clauses Consolidation Act, 1845, and the Water-Works Clauses Act, 1847; and it arose under the following circumstances: On Oct. 15, 1898, the Pontypridd Water-Works Company gave notice to the Bwllfa and Merthyr Dare Steam Collieries, Limited, to treat for certain veins of coal, which it was desired should not be worked, for the protection of the water-works. The matter was submitted to arbitration to settle the amount of compensation; but before the proceedings terminated there had been a considerable increase in the price of coal. It was contended, on the one hand, that the Umpire (Mr. R. F. M'Swinney) should make his award on the basis of the knowledge of the value of the coal seams subsequent to the notice to treat, and not on the basis of the knowledge possessed at the time the notice was given. The Umpire stated a special case for a Divisional Court, giving alternative awards on each basis. The Divisional Court held that the award should be made on the basis of the subsequent knowledge—that is to say, taking into account the enhanced price of coal subsequent to the notice to treat. The Court of Appeal, consisting of Lords Justices Vaughan Williams, Romer, and Mathew, held that the basis should be the value of the coal at the time of the notice to treat. The arguments were heard on the 6th ult., when judgment was reserved.

Mr. UPJOHN, K.C., and Mr. W. DENMAN BENSON appeared for the appellants; Mr. BALFOUR BROWNE, K.C., Mr. FRANCIS WILLIAMS, K.C., and Mr. TREVOR LEWIS represented the respondents.

The LORD CHANCELLOR said he thought Mr. Justice Phillimore had stated with perfect accuracy the question for debate when he used the words: "The true inquiry is not the value of the coalfield or what the value of the coal is, but what the Colliery Company, if they had not been prohibited, could have made out of the coal during the time it would have taken them to have got it." It was not a purchase of the coal, nor was it analogous to a purchase; and it seemed to him the contention that no regard must be paid to what had occurred rested upon the false analogy of a sale. Though there might have been difficulties in the way of assessing the value of the coal, yet when the knowledge was obtained, as it was at the arbitration, there was no reason why it should be excluded from consideration. He moved that the decision of the Court of Appeal be reversed, and the original judgment restored; and that the respondents should pay the costs in the House and in the Courts below.

Lord MACNAGHTEN, in a more elaborate judgment, concurred. He said the notice to treat did not operate to make a contract or to transfer property. It was not even a step towards a contract or a step towards expropriation. No property was acquired; it remained where it was prior to the notice being given. The mine-owner was prohibited from working the minerals, and the other parties were bound to make full compensation to him. The Umpire's duty was to avail himself of all the information at hand at the time of making his award. He added that his noble and learned friend Lord Shand had asked him to express his concurrence in this opinion.

Lord ROBERTSON held that the notice to treat was, to adopt Mr. Justice Phillimore's view, merely a continued embargo on the working of the coal. He agreed with the views expressed by the other noble and learned Lords.

Lord LINDLEY concurred.

The appeal was accordingly allowed, with costs.

Friday, Aug. 7.

(*Before the* LORD CHANCELLOR *and Lords* SHAND, DAVEY, *and* ROBERTSON.)

City of London Electric Lighting Contracts.

To-day their Lordships had under consideration the case of *City of London Electric Lighting Company, Limited, v. Mayor and Commonalty and Citizens of London.* It was an appeal from an order of the Court of Appeal varying a judgment of Mr. Justice Farwell.

Mr. CRIPPS, K.C., and Mr. TROSKILL, K.C., appeared for the appellants; Mr. LAWSON WALTON, K.C., Mr. DANCKWERTS, K.C., and Mr. A. J. WALTER for the respondents.

The question raised was whether certain contracts made with the Commissioners of Sewers of the City of London were void under section 42 of the City of London Sewers Act, 1848, which in effect said that no Commissioner or member of the Court of Aldermen or of the Common Council should directly or indirectly be interested in any contract entered into on behalf of the Commissioners for the execution of works authorized by the Act; that any such contract should be null and void; and that any person holding such position, interested or concerned in such contract, should for the offence forfeit £100. At the date of the contracts in question for supplying light by electricity to the City, there were among the shareholders of the Brush Company (whose interests in the matter were transferred to the present appellants) persons who were Common Councilmen, one being a Commissioner of Sewers. The Lord Mayor also became a registered shareholder a few days after one of the contracts was entered into. The appellants brought an action for a declaration that the contracts were binding on the Corporation; but the latter claimed that they were void under the section. Mr. Justice Farwell decided the point in favour of the appellants. The Court of Appeal, however, held that, as to the two contracts made between the Brush Company and the Commissioners of Sewers, they were null and void *ab initio* by reason of the 42nd section; but, as regarded the Laing Syndicate contract, it was not so void, and that subsequent events did not invalidate it. Both parties, by cross appeals, now contested this judgment.

The LORD CHANCELLOR read a judgment to the effect that he agreed with the decision of the Court of Appeal—that the contracts in question were void under the 42nd section of the Act; and he moved that the appeal be dismissed with costs.

The other noble and learned Lords concurred.

The appeal was accordingly dismissed.

SUPREME COURT OF JUDICATURE—COURT OF APPEAL.

Friday, Aug. 7.

(*Before Lords Justices* VAUGHAN WILLIAMS, ROMER, *and* STIRLING.)

Ilford Gas Company v. Ilford Urban District Council and Jackson.

This was an appeal by Mr. Jackson from the decision of Mr. Justice Lawrance, making him, as Contractor, liable for an injury caused to one of the plaintiff Company's gas-mains.*

Mr. DUKE, K.C., and Mr. W. MACKENZIE appeared for Mr. Jackson; and Mr. C. A. RUSSELL, K.C., and Mr. WHATLEY represented the District Council.

The matter was before the Court of Appeal on the 7th of July, when it was remitted to the Court of First Instance for the Jury to try the issue whether the injury complained of was due to the nature of the work which the third party, as Contracter, was bound or directed to execute, or whether the injury was due to the mode in which the works were executed. The Jury found that the injury complained of was due to the nature of the work which the Contractor was bound to execute, and was not due to the mode in which the work was executed.

Their LORDSHIPS now held that, as the damage resulted merely from the existence of the works, the Local Authority were not entitled to any indemnity from the Contractor in respect thereof. Clause 7 of the contract did not cover damage or injury arising solely from the nature of the works after they had been in all respects duly, properly, and completely executed by the Contractor according to his contract.

The appeal was, therefore, allowed.

HIGH COURT OF JUSTICE—CHANCERY DIVISION.

Friday, Aug. 7.

(*Before Mr. Justice* BUCKLEY.)

Welsbach Incandescent Gaslight Company, Limited and Reduced.

This was a petition for the reduction of the capital of the Welsbach Incandescent Gaslight Company.

Mr. EVE, K.C., and Mr. MARTELLI represented the petitioners. Mr. YOUNGER, K.C., and Mr. KIRBY appeared to oppose, as did also Mr. HOWARD WRIGHT.

Mr. EVE said the petition was presented under the Companies Acts of 1867 and 1877, and asked the Court to sanction a reduction of capital to the amount of nearly £2,250,000. It was opposed by certain shareholders, who alleged that the loss was not quite so great as was stated in the petition; but everyone admitted that there had been a very substantial diminution in the value of the assets. There was a power given in the Articles to modify, under certain conditions, the rights of the contributories, *inter se*; and that had been done by certain special resolutions. The original capital was £3,500,000, in 300,000 preference shares of £5, 1,350,000 ordinary shares of £1, and 650,000 deferred shares of £1. The rights attached to the various classes were: To the first, a cumulative preference dividend of 8 per cent. on the amount paid up, and the right to rank in priority to all other classes, both as to dividend and capital; the ordinary shares had a fixed cumulative dividend of 7 per cent., and ranked as to dividend and capital next after the preference shares; and the deferred shares were entitled, subject to the above, to a fixed cumulative dividend of 7 per cent., and, subject as aforesaid, any profits divisible were to go half to the ordinary shares and half to the deferred. Article 52 gave power to modify these rights by majorities of two-thirds of each class, and by an extraordinary resolution of the Company; and this had been done. An affidavit had been filed denying this; but the deponent appeared to have mixed up two different meetings. He believed, however, it was now admitted that the resolutions were perfectly regular.

Mr. WRIGHT said that was so.

Mr. EVE said the only question he thought was whether the loss had actually been sustained. Of course, it must be to a certain extent a matter of opinion, particularly where a sum of something like £1,500,000 appeared in the balance-sheet as representing goodwill. The proposed reductions were as follows: The capital to be reduced to £1,345,000, divided into 1,500,000 preference shares of 15s. each (the former £5 preference shares having each been divided into five of £1 each before the passing of the resolutions), 1,350,000 ordinary shares of 5s. each, and

* *Ante*, p. 313.

650,000 deferred shares of 1s. each; writing off 7s., 15s., and 19s. per share respectively from each class of shares, as capital unrepresented by available assets. The petition stated that, previous to the passing of the resolution, paid-up capital to the amount of £2,134,539 had been lost or was unrepresented by available assets.

Justice BUCKLEY said the arithmetic did not seem quite right.

Mr. EVE said it was not. There was an error of about £1000. But the evidence proved a very much larger loss.

Justice BUCKLEY said the petition must be amended by inserting the right figure.

Mr. EVE stated that the balance-sheet as at March last was exhibited with the affidavit of Mr. Williamson, the Chairman; and it was in evidence that the position of the Company had not substantially changed since the principal items on the assets side were: Consideration for the undertaking and property, including patents, &c., and 1445 shares of 1000 gulden each (£83) in the Austrian Company. (2) The cost of purchasing the undertaking and patents of the New Sunlight Incandescent Company. (3) The cost of acquiring (*a*) the British and (*b*) the Colonial patents for the Kern burner. These sums were respectively £3,253,545, £111,066, £80,400, and £15,000.

Justice BUCKLEY said there was one item in the balance-sheet which did not appear in the petition—viz., £9166 paid-up capital in this Company.

Mr. EVE explained that the Company had bought up other undertakings, some of which held shares in the Welsbach Company. These shares were included in the assets taken over; and they appeared in the balance-sheet. Probably, the proper course would have been to treat them as surrendered, and extinguish them; but they had been carried forward in this way from year to year. The petition went on to say that these figures were largely in excess of the true value of the items referred to. In the first item of £3,000,000 odd, £1,455,118 represented the cost of the 1445 shares of the Austrian Company—being just over £1000 per share; whereas their true value, as nearly as could be ascertained, did not exceed £180,625, showing a difference between the cost and the value of £1,274,493. He fancied the contest would principally turn on the value of these shares. The evidence put the price at about £125 each, at which figure some had been purchased quite recently. But it was very difficult to fix it accurately, as the Company held very nearly all of them—1445 out of 1500—and there was not much market for the shares. The Company in question was an Austrian concern, constituted according to Austrian law. The idea in acquiring the shares was to give the Welsbach Company the controlling influence; but, by reason of a modification in the statutes and the formation of another Company, the Welsbach Company had, in point of fact, failed to secure what they intended. The Austrian Company manufactured the fluid from which the mantles were made; and they developed patents belonging to Baron Auer, and were now entirely under his control. The Company in fact carried on two undertakings—a gas undertaking and an electric lighting one; and his view was that the capital of the Welsbach Company which was invested in it was being used as a milch-cow for the development of the electric branch, in which the English Company had no substantial interest. The depreciation in the value of these shares represented the greater part of the lost capital. The remainder represented the deficiency in the value of the patents and patent rights, which were now put at £70,000, and the sum credited for the purchase of the New Sunlight Company and the goodwill. The present profit-earning capacity of the Company was £50,000 per annum; and if the goodwill were calculated at fifteen years' purchase, it only came to £750,000, which was alleged in the petition to be a sum in excess of any price which could be obtained for it. The result of these figures was to show a loss of £2,459,387, which was considerably in excess of the amount by which it was proposed to reduce the capital. The loss was really on three items—the Austrian shares, the patents, and the goodwill.

Justice BUCKLEY said the capital or assets of a company might be reckoned in one or two ways. They might take the value of the plant, stock, premises, patents, and so forth, and add three or five years' purchase of the annual profits as goodwill; or they might take a larger number of years' purchase—say 15—of the total earning power. But in the latter case, they could not add the value of the plant, &c., employed to earn it.

Mr. EVE said they had estimated the value of the various items of property, and had taken a very liberal allowance—15 years' purchase—as the value of the goodwill. This, of course, was an arbitrary figure. One point which would arise was this: It was not disputed that the earning capacity of the Company was about £50,000; but it was said that the dividend on the Austrian shares ought to be added to that. Now, originally the dividend was very high—100 per cent. at first—but it had gradually declined to about 30 per cent., and was, in the opinion of the petitioners, a diminishing quantity. It had been steadily going down; and a further diminution in future was feared. The petition went on to state that the loss of capital was due (apart from the depreciation in the Austrian shares) partly to the exaggerated price paid by the Company for the undertaking, and partly to the running out of the patents. Two of the principal patents had expired; and the third would do so in less than four years. The patents acquired from the Sunlight Company had no practical value, and were only purchased to put an end to litigation and competition. The value of the Kern patents was put at £8000, as against £95,000 at which they stood in the balance-sheet. The principal affidavit in support of the petition was by Mr. Williamson, who took the position of Chairman of the Company after a very exhaustive inquiry conducted by a Committee of which he was a member. This inquiry culminated in a report which was adopted by the shareholders, on which the old Board of Directors resigned and a new one was elected in December, 1901. He then gave details of the meetings, at which the scheme was adopted by very large majorities; the ordinary shareholders being unanimous. At the extraordinary meeting of the Company as a whole, the resolution was carried almost unanimously. These meetings all took place on May 27; the confirmatory meeting being on June 11, when all the shareholders but one supported it.

Justice BUCKLEY said practically the opposition seemed to be confined to the holders of 40,947 preference shares.

Mr. WRIGHT remarked that he represented a deferred shareholder, who opposed.

Mr. EVE proceeded with the affidavit of Mr. Williamson, which exhibited a series of balance-sheets of the Austrian Company, and described the change in the constitution of that concern, which was now divided into two undertakings, "A" and "B;" the shares in the latter being all allotted to Baron Auer, in payment for his inventions with respect to electric lighting. But undertaking "A" was to find large sums for "B" to carry on business with. Under these new arrangements, Baron Auer practically controlled the whole concern—both "A" and "B."

Justice BUCKLEY asked how this was done, seeing that the Welsbach Company held nearly all the shares in the Austrian Company.

Mr. EVE said he could not explain how it took place. A good deal of discussion arose at the meetings; but there seemed to be no doubt about the fact. The affidavit went on to say that, in consequence of the lapsing of the patent under which the mantles and chemicals were manufactured, large reductions had had to be made in the prices charged, though the raw material was dearer. He was of opinion that £125 each represented the full value of the Austrian shares. There were two affidavits by officials of the Austrian Company corroborating these statements; and affidavits by Mr. Mackeen and Mr. Ballantyne as to the value of the British patents, which they put at £70,000 at the outside. The latter gentleman said that at present the Company had no effective monopoly in incandescent lighting. After referring to some of the statements made by Mr. Loch in his affidavit in opposition, Counsel concluded by submitting that the case made out for the reduction was amply proved.

Mr. YOUNGER said he appeared for the Investors' Defence Corporation, Limited, and also for the Merchants' Trust, Limited, who between them held £30,000 worth of preference stock in the Company. He submitted, in the first place, that, under the Act of 1877, the exact amount of loss alleged must be strictly proved, or the Court had no jurisdiction to make an order. He contended that the alleged loss had not been satisfactorily established, and, secondly, if his Lordship were against him on this point, that the scheme was not fair to the preference shareholders; and on that ground the Court, in the exercise of its discretion, ought not to make the order. On the first point, he argued at great length that the Austrian shares were worth a great deal more than £125 each, and at any rate that the dividends on the shares ought to be included in the annual earnings of the Company, on which the goodwill was calculated. He quoted from the last report of the Directors to show that the Company were entering on more favourable times, having abandoned their old policy in favour of a more commercially sound one, and submitted that the burden of proof had not been discharged by the petitioners. Next, assuming he were wrong in this, he submitted that the scheme ought not to be sanctioned, having regard to the way in which the rights of the shareholders *inter se* were affected.

Justice BUCKLEY suggested that, by the constitution of the Company, the majority had power to determine what their rights were, or should be in future, and had done so.

Mr. YOUNGER cited the recent decision of the Court of Appeal in Allsopp's case, to show that, notwithstanding the vote of a majority, the Court would inquire into the fairness of the scheme as a whole. His clients opposed this scheme, because, being Trust Companies, they held preference shares in many concerns; and if these schemes were approved, it would imperil the position of preference shares in all industrial undertakings.

Justice BUCKLEY said it was not this scheme which imperilled the position, but the adoption by companies of such an article as the one here in question, which empowered majorities to bind minorities with respect to their rights.

Mr. YOUNGER submitted that it was impossible, on business grounds, to justify the way in which the preference shares were dealt with. They were deprived of all arrears of dividend, and except as to 40 per cent. they lost their preference altogether.

Mr. KIRBY followed on the same side.

Mr. WRIGHT said he appeared for Mr. Blaber, the holder of 3100 deferred shares. His view was that, having regard to the present position of affairs—the Company having lost £29,000 and more on the last year's trading, and having in the present year under new management made a profit of £52,000—it was most unfair to the deferred shareholders to seize upon the present moment to put forward this scheme, which reduced their property to 1s. a share. He submitted that the Company ought to be left for a time in *statu quo*, so as to let the deferred shareholders have some chance of reaping the benefit of the improved management.

Saturday, Aug. 8.

In giving his judgment this morning,

Justice BUCKLEY said the Company had a capital of £3,479,539; and the present application was for the sanction of the Court to a reduction by no less a sum than £2,135,562 1s. The petition was opposed, not by any creditors, but by certain shareholders who held a comparatively small amount of stock, but who were none the less entitled to oppose. They first challenged the amount of the loss alleged, and, secondly, they said that, even if it had been sustained, the scheme for providing for it was unfair. With regard to the loss, it was to be borne in mind that when a company wrote off lost capital, it was doing something which was no injury, but, on the contrary, was a benefit to its shareholders. The effect might be, and the object generally was, to enable the company to resume payment of dividends, which was for the benefit of the shareholders. The persons who might be injured were the creditors; and the question whether the loss had in fact been sustained was therefore always carefully looked into by the Court. He was glad to see that, although an order had been made dispensing with the use of the words "and reduced" by the Company pending the hearing of the petition, these words had been inserted in the advertisement, so that the attention of creditors might be drawn to it, and they might have opposed if they thought fit. A large part of the assets of the Company consisted of 1445 shares in a Company constituted

according to Austrian law. The great bulk of these were acquired some years ago at a cost of £1028 per share; and a few others had been acquired since—the last having cost about £125 per share. The aggregate amount paid for these shares was £1,455,118; and the petitioners alleged that their value was now not more than £180,625, so that there was a loss on that asset alone of £1,274,493. These shares formed part of 1500 "A" shares in the Austrian Company. But there were 2000 "B" shares, over which this Company had no control; and certain obligations had been undertaken as between the "A" capital and the "B" capital which were not favourable to the interests of the former. The profits on these Austrian shares had fallen very largely—from 100 per cent. five or six years ago to 30 per cent. at present. No one could say how long this rate would continue; and the Austrian patent had expired. Evidence had been given as to the present value of the shares, which put them at £125. This resulted in the figure he had named. But he need not, in the circumstances, decide whether this was conclusively proved, as the other figures with which he had to deal allowed a very large margin. Loss was alleged upon certain other items, four in number, which might be concisely described as patents and interests in patents. These had cost the Company £2,004,894, and were said to be not worth more than £70,000—showing a loss of £1,934,000 odd. As against this, the petitioners, erroneously he thought, gave credit for fifteen years' purchase of the goodwill, at the present earning rate of £50,000 a year—making £750,000. Deducting this from the loss on this head, it was reduced to £1,184,894. Adding this to the former figure, the total loss sustained was £2,459,387, which left a margin of £323,825 over the amount proposed to be written off. To this, however, something had still to be added, for the following reason: Where you valued a concern upon the footing of taking so many years' purchase of its annual earnings, you had in the calculation included the value of all its assets, and you must not add to the capitalized value of the income the value of the assets which earned the income. This was doing it twice over; and it was what the petitioners had done. He thought, when the assets were valued separately, one could not take more than three years' purchase of the earnings, as goodwill; and this figure, therefore, ought to be reduced from £750,000 to £150,000—giving £600,000 to be added to the margin above referred to, and bringing it to £923,825 beyond the loss alleged. On the other side, however, the petitioners had omitted to give credit, as they should have done, for £11,000 odd to the suspense account, and £129,000 to the credit of the profit and loss account. These sums together came to £141,664. Calling it in round figures £150,000, and deducting it from the £600,000 to be taken from the goodwill, it left £450,000 to be added to the margin shown on the petition, which brought it to £773,000. Against such a margin, it did not matter if you increased the assumed value of the Austrian shares even to £300 or £400 instead of £125; still the alleged loss would have been sustained. The other item of loss was a somewhat startling one no doubt. Patents and interests in patents acquired for a little over £2,000,000 were said to be worth now only £70,000. But the evidence about it was this: The Company acquired 44 patents, which had all expired but one. This had 3½ years to run; and it was quite impossible that one patent with such a short life could be worth £2,000,000. There was evidence—which, of course, was only estimate, but was unanswered—that £70,000 was a fair, if not an outside, value for this patent. He did not think it necessary to examine with any nicety whether this was the exact value, because, if the previous figures he had referred to were right, there was ample margin to allow for a very large increase in the figure. The result, therefore, was that, in his opinion, the alleged loss had been sustained. After explaining what, in his view, was the meaning of the words of the Act "lost or unrepresented by available assets"—viz., that it must be a permanent, but not necessarily irretrievable, loss—his Lordship went on to deal with the second ground of objection, that the scheme was unfair to the holders of preferred and deferred shares. He went in detail through the figures as to the holding of those who opposed the petition, and the voting at the meetings, and held that the minority were, under Article 52, clearly bound by the vote of the majority. Beyond this, he saw nothing whatever unfair in the scheme, and sanctioned it accordingly. But he imposed two stipulations. Section 4 of the Act of 1877 provided that the Court might, if it saw fit, require a company which reduced its capital to publish the reasons for such reduction, or such other information regarding the reduction as the Court might think expedient, with the view of giving proper information to the public as to the causes which led to such reduction. He thought in this case it was right that such information should be published; and he should refer it to the Registrar to settle the notice which should be issued, and to direct in what manner it should be published. He should also direct that the words "and reduced" be used for three months, over the place of business, in all stationery, and in any documents; but it need not be used on packing cases, labels, &c. He also directed that the unissued deferred shares mentioned in the petition should be identified by their numbers. He allowed the costs of those who had opposed the petition, as they had been of assistance to the Court in dealing with the matter.

Charge of Damaging a Prepayment Meter Lock.

A foreman platelayer named George Dakin was charged at the Huddersfield County Police Court recently with damaging a prepayment gas-meter belonging to the Honley Urban District Council. When the meter, which was in defendant's house, was inspected, the lock was found to have been broken, and 7d. was missing. Defendant's wife offered to refund the money; but this was refused. The meter was not damaged in any way. Defendant stated that the lock of the meter was exactly in the same condition as it had been left by the gas-works officials. At Easter the lock was loose, and information was sent to the gas-works; but it had not been attended to. He denied taking any money. The Bench dismissed the case.

Flamborough Water Supply.—A competition which has lately been held for the best scheme for the water supply of Flamborough has resulted in the plans of Messrs. Elliott and Brown, of Nottingham, being adopted. Fourteen schemes were submitted.

MISCELLANEOUS NEWS.

THE GASLIGHT AND COKE COMPANY.

The Half-Yearly Meeting.

The One Hundred and Eighty-Third Half-Yearly Ordinary General Meeting of Proprietors was held on Friday at the Company's Offices, Horseferry Road, Westminster—Colonel Sir W. T. MAKINS, Bart. (the Governor), in the chair.

The SECRETARY and GENERAL MANAGER (Mr. J. W. Field) read the notice convening the meeting; and the seal of the Company was affixed to the Register of Proprietors.

The GOVERNOR: I presume the meeting will take the report as read, as is usual. Then it is my duty, ladies and gentlemen, to address you upon the report. The past half year has been one full of interest, and will constitute an epoch in the history of our Company. Its most important event has been the ratification by Parliament of a new treaty, which may well be described as a "Treaty of Peace," between the Municipal Authorities, who represent the consumers, and the Company. Next perhaps in importance is the decision come to by the Board of Trade to review the testing regulations to which we have submitted with more or less patience for many years. Finally, there have been some very important changes in the official staff. But, before I go into these matters, I will draw your attention to the working results of the half year, which, with one important exception, are all distinctly favourable. I take first the capital account, and will, as usual, give you the principal figures. The total expenditure amounts to £57,510; and, with the exception of £5421 expended on works, the whole of this outlay is for distribution plant. This, coupled with the carbonizing machinery, will, I may say, for some time to come be the character of our capital expenditure, as we have a good working margin of manufacturing plant. I may be asked, Why, with apparently a shrinkage of business, should you require to spend more capital on distributing plant? The answer is, that new districts and new customers must be provided with a supply of gas, and the means of consuming it. We have had to lay new mains to the extent of 5 miles during the past half year; the number of our automatic consumers has increased by 7887; while the increase in the number of gas-stoves has been 11,000. Turning to the revenue account, the one unfavourable item is the first on the credit side—viz., gas rental—which shows a reduction in the receipts for sales of gas amounting to £62,000. This is almost entirely attributable to the absence of cold weather during the last days of January and the month of February. We are sometimes accused of attempting to hide our own shortcomings by blaming the weather for the reduction in revenue; but there is no doubt that, as in the business of agriculture so in that of gas supply, you cannot have a good harvest in the absence of propitious weather. If you will look at the diagram on the screen [indicating same], you will see that the reduction of output corresponds almost exactly, in the inverse ratio, with the rise in the temperature. This fact is specially noticeable in the February lines; and it is interesting to note that, out of the 4 per cent. reduction for the whole half year, more than 3 per cent.—or 75 per cent.—took place in that abnormally warm month. Other companies have felt the same effect of such weather upon their consumption, though not all to the same extent, because the normal growth of their business, in their undeveloped districts of supply, more than balances the reduction of consumption which is common to all alike. The extraordinary temperature of February is shown on the diagram, and the corresponding decrease in the output of gas; and I may say, of course, in January and February the abnormal weather is more important to us than any abnormal change at this time of the year, when the output is so much smaller. Again, the adoption by the public of the incandescent system of gas lighting—a system which we welcome, and do all we can to extend, although we know that, for the present, it reduces the consumers' gas bills at our expense—undoubtedly accounts for some portion of the decrease in gas sold. I am glad to say that the system is making great progress, both in public and private lighting; and it is the best weapon we can use for meeting the electric light competition. The number of public lamps in our district lighted under this system will shortly be upwards of 31,000, or nearly 75 per cent. of the whole. There is a satisfactory increase in the receipts for stove-rental; and although it only amounts to £1825, it is evidence of the maintained appreciation by the public of the use of gas for heating and cooking purposes. Fortunately, there have been considerable savings in the charges for manufacture and distribution; and this loss of gas-rental of £62,000 has been more than met by the £136,000 reduction in our net expenditure. With the exception of a slightly increased distribution (wear and tear), all the important items of expenditure show reductions. The net cost of coal—that is, the gross cost, less the receipts from residuals—has been reduced from 6s. 5·4d. to 4s. 11d. per ton, or a net saving of £90,000—equivalent to 1¾d. per 1000 cubic feet of gas sold. Wages—and this we think is a very gratifying saving—are less by £16,000, equal to ¼d. per 1000 cubic feet of gas. Manufacturing wear and tear is £11,676 lower, and purification £5000, or 0·16d. per 1000 cubic feet. Of course, the smaller output of gas is accountable for some portion of these economies; but the general results are most satisfactory—the reduction in cost being at the rate of upwards of 2d. per 1000 cubic feet. Shortly, the net result is as follows: Taking the debit side of the revenue account, the revenue profits are more than in 1902 by £75,571. On the other side, the net revenue charges are less by £2967, so that the net profits are more by £78,538. Out of this improved profit, we recommend an increase in the dividend rate of 8s. per cent. per annum, which amounts to £30,486; and we then carry to undivided balance a sum larger by £48,052 than the corresponding item in the June half year of 1902. Under ordinary circumstances, out of the profit for the half year we might have paid the maximum existing

sliding scale rate of dividend at £4 18s. per cent. per annum, which would have absorbed £38,000 out of the £51,383 which we are adding to our undivided balance. But, for reasons which seemed to the Directors convincing, we abstained from increasing the dividend beyond the rate paid last half year. The new scale of dividend under the Act of this session comes into operation next year; and the dividend, under its provisions, attached to the price of 3s. per 1000 cubic feet (the existing price) is £4 8s. Thus, by limiting the dividend on this occasion to this rate, we seek to secure a continuity of a moderate rate of distribution. Had we paid the full rate under the existing scale this year, and then next year had come down to the new scale rate, the reduction would no doubt have caused much disappointment; whereas by paying the new scale rate and building up a balance, we are doing what we can to safeguard both the price of gas and the scale rate of dividend for the future. You will have observed from the balance-sheet that the improved financial position of the Company has enabled the Directors to reinvest the amount of the reserve fund, which for the past two years has been used as working capital. This improvement in financial position is further evidenced by the reduction of £2967 in the item of interest on temporary loans. There is one other satisfactory feature in the balance-sheet to which I would draw your attention—namely, the reduction by nearly £29,000 in the suspense account in connection with the automatic meter system of supplies. During the twelve months £38,000 has been added to this account; but £67,000 has been written off from it. Under existing circumstances, I suppose that the speech of no Chairman of a Railway or Gas Company would be complete without some protest against the ever-increasing burden of rates. Although, owing to an exceptional credit on income-tax account, the amount charged for the half year was less than in June, 1902, our experience has been a further increase in the rate of 2½d. in the pound. The figure to-day is 7s. 6¼d. in the pound. Five years ago it was 6s. 2¼d. Ten years ago it was 5s. 8½d. This is an increase of 33 per cent. in ten years. As I am reminded, it is not only that, but there is an increase in the assessment, which has materially added to the burden we have to bear. We are bound to provide for an even greater rate of increase in future, because in the case of one important borough—that of St. Marylebone—the ratepayers have to face a liability of something between £1,000,000 and £1,500,000, which the Council have to provide for the purchase of the electric light undertaking. I am told (though I cannot vouch for the accuracy of the information) that it is quite likely the rate will be 20s. in the pound for some little time to come in Marylebone. Surely the Government will make a serious endeavour to deal with this most urgent question—the expenditure of the local authorities on the one hand, and the practical denial of all representation to those who are by far the largest ratepayers (Joint-Stock Companies) on the other hand. I commend this to the individual shareholder, who can do something by bringing pressure to bear upon his representative in Parliament. Of course, everything that can be done to protect ourselves against this action of the Municipal Authorities is being done; and one notable instance, in which the credit is due to the Chairman of the South Metropolitan Gas Company, is the inauguration of what is known as the Bermondsey clause, which has found its way into so many Acts of Parliament in the past session. As to the immediate future, the price of coal purchased by us for the coming twelve months is lower by 6d. to 7d. a ton than that of last year; and we have just made our purchase of oil at a price which, though it shows an increase on last year's prices, will not disturb the Company's policy in regard to the manufacture of carburetted water gas. On the whole, therefore, the outlook for the current half year is encouraging; the only uncertain element being the character of the winter weather. If we could only get a few friendly fogs, it would make a deal of difference to us. (Laughter.) I will now proceed to the most important matter mentioned in the report. I refer to the passing of the Company's Bill; and in doing so, I can congratulate the shareholders on the termination of a long and difficult struggle. It is quite true that the terms of settlement are onerous, in view of the premium paid under the auction clauses for stock in years past; but they are certainly no worse than the course of recent legislation had led the Directors to anticipate, although they were not so indiscreet as to admit this when discussing the matter with you in February last. When we compare the terms of the London County Council Bill (which was, by agreement with this Company, withdrawn) and those of the Company's own Bill as deposited, it is satisfactory to find that, in respect of all prices of gas below that of to-day—3s. per 1000 cubic feet—the Company have secured better terms than the mean of the difference between the two sets of original figures. That is to say, the London County Council have more than met the Company half way. But the most important point secured is the withdrawal of the proposed interference with the Company's standard illuminating power of gas. This at one time threatened to be a serious matter, because the reductions in price which had been agreed to by other companies in consideration of a reduction in illuminating power, would have been quite impossible of acceptance in our case. I am not going to enter into the discussion of 14-candle gas *versus* 16-candle gas. Experts differ so very widely that, at the present moment, there appears to be only one point of common ground, and that is that a candle reduction is not worth 1d. reduction in price. Indeed, the last word I have read on this subject (by an accepted authority) is to the effect that a reduction in illuminating power should carry no reduction in initial price. Possibly the Board of Trade Committee may throw some light on this hotly debated point. In any case, I think that the Company are to be congratulated on being saved the trouble and expense of any such discussion in the House of Commons on their Bill. This comparatively satisfactory result of our application to Parliament has not been secured without prolonged and anxious negotiations. These we opened by our letter to the London County Council in March, asking for an interview with the members of the Parliamentary Committee of that body. On Monday, March 30, we met these gentlemen; and (though, I must say, we were received with great courtesy) the result was, to say the least, not particularly reassuring. Negotiations were, however, continued; each party, as is usual in such cases, yielding as little as possible, and endeavouring to secure the best terms. After almost daily meetings and discussions, at the beginning of May we arrived at a settlement, and were enabled to submit a practically unopposed Bill to the Committee of the House of Commons. In this way, we avoided all the heavy expenditure attending a contested measure, both of rates, to which we contribute so largely, and also more directly of the funds of the Company. The net result of our labour is shown on the tabulated statement which was sent out with the report. I do not know whether this statement is clear to the shareholders generally; but if any question is asked on it, I think I shall be able to make it quite clear. With regard to our redemption fund, which was one of the provisions of the Bill in 1901, we proposed to set aside 5s. per cent. without limit before we divided anything over 4 per cent. The Company proposed in 1903 to set aside 8d. per cent. out of every 2s. 8d. increase in the dividend fund. This is equal to 25 per cent. The limit proposed was the satisfying of the Board of Trade that the obsolete capital had been extinguished. The London County Council proposed this year to set aside 1s. 4d., as I explained in February, instead of 8d., out of every 2s. 8d. increase in the dividend fund, without any limit as to amount. Out of every increase of 2s. 8d. arising from a reduction in the price of gas, they proposed to take 1s. 4d.—that is 50 per cent. of it—and devote it to the redemption of obsolete capital, without putting any limit. Under the Act, we have a limit of £1,000,000 as the amount to be so redeemed; and we set aside an average of 20 per cent., instead of 50 per cent., out of the 2s. 8d. for the purpose of meeting the charge. So that I think, as regards the redemption fund for obsolete capital, we have done very much better than I anticipated. To the consumers of gas the money result of these new provisions as to initial price and standard rate of dividend is that when the price of gas is at 3s. (as it is to-day), there will be a saving on dividend account of £56,000 a year, four-fifths of which, or £45,000, will be available for a reduction in the price of gas—that is, about ½d. per 1000 cubic feet—the remaining one-fifth going to the shareholders. There are one or two other questions relating to the parliamentary proceedings of the session which are of interest. The first is that the Bill of the Thames Conservancy Board, which contained provisions for imposing rates upon coal, oil, and residual products of gas companies, has been withdrawn. In its place, however, stands the Government "Port of London Bill," which is still under consideration. I do not think it has been formally withdrawn; but it is in rather a "dicky" condition. While it foreshadows similar impositions, it contains, as the result of the opposition of the Company and other riverside manufacturers, protective clauses which, while they do not relieve the gas industry from the threatened taxation, lead us to hope that no such taxation will be carried into effect without our being heard against it before some impartial tribunal. Another cause of satisfaction is the withdrawal by the London County Council of their very objectionable Bill, under which additional power was sought to enable Councils of Metropolitan Boroughs to purchase electric light undertakings. One other matter to which I referred in my address last February was the proposal of the London County Council to give the Councils of Metropolitan Boroughs power to expend public money in electrically fitting up houses. This power was, I am glad to say, refused by Parliament; and I think this may possibly be taken as evidence that Parliament is waking up to the danger of unrestricted municipal trading. Protective clauses have been obtained in other Bills affecting the interests of the Company. I will now shortly refer to the inquiry which the Board of Trade have decided to hold on some matters upon which the Metropolitan Gas Companies feel more or less aggrieved. Generally speaking, we contend that the nature and quality of the gas supply of the Metropolis are dealt with by the governing authorities—I mean the Metropolitan Gas Referees—too much in the spirit of the laboratory or analytical chemist, rather than of the Commercial Department of the Board of Trade. All the infinitesimal refinements which are brought to bear upon the question of the illuminating power and the purity of the gas sent out under varying conditions of temperature of manufacture and distribution, and in daily volume of from 100 to 150 million cubic feet, appear to us, who have to maintain the supply on commercial lines, to be exaggerated and altogether out of place. This is clearly a matter which requires to be reconsidered; and if this general question can be satisfactorily settled between the Companies and the Department, the other causes of difference between us—such as Sunday testing, the travelling photometer, and the humiliating form of the magisterial proceedings—will, if not directly removed, doubtless disappear. Of course, if this happy consummation is to be attained, the proposed inquiry must not be too scientific in its character or scope. The question is, as I have said, primarily a commercial one; and the commercial element should be conspicuous on the Committee, so that our views as suppliers of gas may be heard and considered quite as fully as the views or visions of the chemical experts. Let it be understood, we are not seeking to be relieved of any part of our parliamentary bargain; neither are we seeking to supply an inferior or less pure illuminant. This would be folly in these days of competition with the electric light. What we do seek is that these things should be secured without the vexatious and costly systems of check now in force. I now come to clause 7 of the report, which deals with the changes in the staff caused by the retirement of Mr. Field. The report expresses the feelings of the Court in regard to the loss of his services, which have been long, and latterly very arduous; but I am sure the meeting will forgive me if I add my personal testimony as to the loss which the Court, and the Company, suffer by his retirement. I have been, necessarily, in closer touch with our Chief Officer than anyone else connected with the Company; and it would be impossible for anyone to watch his work, and join in it, as I have done, without being amazed at his industry and devotion to the Company's interests. There is no doubt in my mind that to this devotion, and the constant strain which it involved—especially during the last few years—the deterioration in his usual good health is attributable. I hope, I am sure we all hope, that—as he has wisely taken advice, and is giving up in time an occupation in which he delighted—his health will, after a period of rest, be as good as ever. I know that he will always give us, when we need it, the benefit of his knowledge and experience. The best wishes of the Court, and of his colleagues in the service of the Company, will follow him in his retirement; and I am sure that will also be so in

the case of the proprietors. As stated in the following paragraph, we have decided to apportion the work carried on by Mr. Field between the Assistant General Manager and the Assistant-Secretary, both of whom have, for some years, worked under Mr. Field, and who are, we believe, fully capable of taking up and carrying on the business of the head office. Some six years ago, I submitted to my colleagues a proposal to appoint an Assistant to the General Manager, to act as an under-study, and to make himself capable of undertaking the work of the General Manager with a view to succeeding to the office when a vacancy occurred. The Court adopted my view that such a policy was desirable, not only in the case of the General Manager, but also in the case of other heads of important departments; and, after considerable difficulty in obtaining suitable candidates, Mr. Milne Watson was selected for the position then created. Mr. Watson has served his apprenticeship under very favourable circumstances. The past five years have presented the best opportunities for one in his position to make himself acquainted with every detail of the Company's undertaking. I refer, of course, to the several recent parliamentary inquiries, which have necessitated research and preparation in every department of the service. In this work, Mr. Watson has been closely associated with Mr. Field, who assures us that his Assistant has made the best possible use of his opportunities. More than this, to a full share of native shrewdness, Mr. Watson brings a manner which has enabled him already to gain a position in relation to the members of the Company's staff which will, I believe, assure for him the same consideration and loyal support which Mr. Field has so uniformly received at the hands of the officials of the Company. For these reasons, the Court, while fully conscious of their importance, have decided to entrust to Mr. Watson the duties of the General Manager which Mr. Field is shortly to relinquish. I am very glad to say we have also, in a similar manner, carried out the same policy in relation to the Chief Engineer's Department, and have strengthened Mr. Trewby's hands by the appointment of Mr. Goulden as Deputy Chief Engineer. Mr. Goulden's long service with the Company at Beckton served to eminently fit him for this post; and the Directors have every reason to be satisfied with the results of their action. No large Company like ours should be dependent on the sole and unaided service of a single officer at the head of its chief departments; and the strengthening of the executive staff in this direction cannot fail to be of benefit to the undertaking. The outdoor department has also been strengthened by the appointment of a Chief Officer to the distribution portion of its work, who has relieved Mr. Foulger from the increasing duties in connection with the consumers in such matters as incandescent lighting (public and private), stoves, and meters, &c. This leaves Mr. Foulger to deal with the all-important duties involved in the charge of the mains, valve-houses, &c., together with the laying and relaying of new and old mains. It will be the duty of Mr. Goodenough, the new Chief Inspector, to push the sale and use of gas, both in public and private lighting, as well as for fuel and motive power purposes; and in carrying out this policy of the Directors, he will have their support to the fullest extent. The fixing of the salary of the Secretary is (under the Companies Clauses Consolidation Act, 1845) reserved to the shareholders in general meeting; and the Court suggest that Mr. Rayner's salary should commence at £700 per annum, rising to £1000 per annum by three yearly increments of £100. If the shareholders agree with our suggestion, they will no doubt pass a resolution to that effect. I do not think I need say anything about Mr. Rayner. He has become thoroughly identified with the Company —having served for so long a time under the late Mr. Phillips and Mr. Field—and is a man in whom the Directors have great confidence and every respect; and I hope that this opinion of him will be confirmed by the shareholders. I will only say, in conclusion, that I believe that the events of the half year have tended to place the Company on a more settled basis with improving prospects; and that the shareholders may rely on the Directors continuing to devote their best energies to the management of the Company's business. I beg to move—"That this meeting do agree with, and confirm, the report of the Directors and Auditors' report and statement of the accounts of the Company as transmitted to the proprietors on the 30th ultimo."

The Deputy-Governor (Mr. Howard C. Ward): I have very great pleasure in seconding the adoption of the report, and I congratulate the shareholders upon the improved condition of the Company.

The Governor: Does any shareholder wish to ask any question or to make any remarks?

Mr. C. E. Jones said he had much pleasure in supporting the motion which had been so ably moved by the Governor and seconded by the Deputy-Governor. The report was the most important the shareholders had received for 30 years, as it indicated a new departure. The Company had received the Royal Assent to their Bill, which was important; but what was of far greater importance, they had regained the confidence of Imperial Parliament! The fact that the initial price had been reduced, appeared to many to be a great mistake; but for his own part he attached very little importance to an initial price. The consumer had nothing to gain by it; all that interested him was the selling price, and the lower this was the better he liked it, and the more solid it made the foundation of the Company. Supposing gas were superseded by a cheaper illuminant, what would become of the initial price? Another important feature, to his mind, was the reduction of capital. The capital of most gas companies in this country was not represented in bricks and mortar, as it ought to be. The capital of the Gaslight and Coke Company ought to be represented by structural works, and by floating capital and goodwill. In his humble judgment, the capital was too high at the present price; and he thought the Directors had acted wisely in taking means to reduce the capital. This was a matter for great congratulation. The Company would be all the stronger for it; and as far as the diminution of dividend was concerned, that was, after all, but a very small thing. Referring to the retirement of the Secretary, he said he thought that Mr. Field, after his very long period of arduous duty, had well earned his retirement after having rendered to the gas industry an enormous service. As an old professional man, he should be voicing the opinion of the gas profession when he said that the whole profession wished Mr. Field peace and quietness in his well-earned retirement. He would carry from the present meeting at any rate the respect and admiration of the shareholders; and he (Mr. Jones) ventured to hope when the sere and yellow leaf came along, he would find that "rest and peace which passeth all understanding." He failed to see anything in the affairs of the Company which should alarm the proprietors or justify them in rushing into the market to dispose of their holdings.

A Shareholder said he noticed that the Company had a limit of £1,000,000 put upon the new redemption fund; and he should be glad if the Governor would kindly tell them what was proposed to be done with the fund after the million was wiped off.

The Governor: It will cease, and the dividend will then be paid in full. The redemption money will be used to purchase stock, and extinguish it. [After a pause:] If no other shareholder has any remark to make, I will notice two points in Mr. Jones's speech. He says he "does not think much of any initial price;" but initial price must follow from the auction clauses. You could not work one without the other. Unless the man who is going to buy stock at the auction knows what he is going to get, he will not know what to bid. So there is a certain amount of importance attaching to initial price. With regard to Mr. Jones's second point—that if gas were superseded by some other illuminant the initial price would go—all I can say is that not only the inital price would go, but all the capital and everything else would go. But that contingency is happily not within the range of consideration at the present moment. I was glad to hear Mr. Jones's kind remarks with regard to Mr. Field. I am pleased to see so many ladies present; I feel certain the extra number of them here to-day is in consequence of their wishing to take a last look at Mr. Field.

The resolution was then put and carried unanimously.

The Governor next proposed a resolution authorizing the payment of a dividend as recommended in the report.

The Deputy-Governor seconded the motion, which was unanimously adopted.

The Governor: I have now to submit to the shareholders the question of the remuneration of the Secretary, who will succeed Mr. Field. I suggest that the remuneration of Mr. H. Rayner as Secretary of the Company be the sum of £700 for the first year of his appointment—such salary rising, by annual increments of £100 each, to the maximum salary of £1000 per annum.

A Shareholder seconded the motion.

Sir George Livesey: Are you paying enough, considering the size and importance of the Company? I would much rather see the meeting adopt a resolution that, if after the lapse of twelve months Mr. Rayner should have proved himself an efficient Secretary, the salary should be increased to £1000 at once.

The Governor: I am sure the Court would accept with much pleasure such an amendment, if it were moved. We were anxious not to go too fast.

Sir G. Livesey: I do not wish to interfere with the discretion of the Court in any way; but if you say you will accept it, I will move as an amendment that, if at the end of the year the Directors think Mr. Rayner has performed his duties satisfactorily, they should increase the salary to £1000.

The Governor: I think it would be preferable to pass the resolution in the terms proposed, and to bring it up again at the end of twelve months. Under the Companies Clauses Consolidation Act, we could not pass a hypothetical resolution like that.

The motion was then put and carried.

The Governor: That concludes the business of the meeting, and I have to thank you very heartily for having listened to my rather long remarks, and for having so cordially approved the action of the Board.

A hearty vote of thanks was passed to the Governor for presiding, and to the Directors for their skilful management of the Company's affairs.

The Governor: Ladies and gentlemen, we are very grateful to you.

BRENTFORD GAS COMPANY.

The Half-Yearly Ordinary General Meeting of this Company was held on Friday, at the Charing Cross Hotel—Mr. Howard Charles Ward in the chair.

The Secretary (Mr. William Mann) having read the notice convening the meeting, the report and accounts [which were noticed in last week's "Journal," p. 318] were taken as read.

The Chairman remarked that the position of affairs was such that the Directors had very great pleasure indeed in meeting the shareholders. Of course, the half year under review had not been at all what he would call a "bumper" one. Weather influences had been rather against a great consumption of gas. They knew that in the case of one or two of the Metropolitan Companies the rates of increase, as compared with the increase in the corresponding period of last year, had been considerably reduced. One Company, whose general meeting he had just left, had absolutely experienced a decrease in the amount of gas sent out, as compared with the same period of 1902, of about 4 per cent. It was a funny sort of thing, too, that from the published accounts of their good friends over the water, the South Metropolitan Gas Company, it appeared that they had had a decrease in the output of gas, as compared with the Midsummer of 1902, of a precisely similar extent. This went to show that these climatic influences affected them all very much alike. The Brentford Company, he was happy to say, had experienced an increase of 5 per cent. in the output for the first half of last year, and, in spite of all the adverse circumstances against which they had had to fight, the Board had again the pleasure of informing the shareholders that there was an increase in the six months just completed of 4·79 per cent. This was a good indication of the way in which the Company were going on. He knew some other Suburban Gas Companies—take, for example, the Tottenham Company, the Hornsey Company, the Colney Hatch Company, and

the Lea Bridge District Company, who had what he might call purely suburban districts—were growing tremendously fast, and, in spite of adverse conditions, showed very considerable increases in business. But he thought their own increase of nearly 5 per cent. was a very good one, considering all things. The Directors continued to carry out their policy of writing off for depreciation on stoves, prepayment meters, and fittings a very considerable amount—in fact, for the last half year they had written off more on account of old meters and fittings than they had absolutely expended out of capital. The latter figure was £10,469; while they had written off £11,700. But they had also, he was pleased to say, reverted (with the permission of the Official Auditor, who quite approved of their doing it) to the old practice of the Company, which was introduced by his own father years and years ago, of writing off something for the general depreciation of plant. They did this up to the time when Mr. Parkes, the late Chairman of the Great Eastern Railway Company, became their Official Auditor; but he took exception to it. The Board had, however, ventured to approach Sir Robert Giffen, and point out that it was only a business-like and proper thing to do; and he quite fell in with their view, and permitted them to write off £3000 a year on account of general depreciation of plant. As regarded the revenue account, he thought every item was favourable. There was, of course, an increase in the rental, as the price of gas had remained the same; and the receipts from coke and tar were also larger. On the other hand, coals, although they had consumed more, had not cost so much; but there were sundry items that were very heavy. Of course, they had charged everything most liberally against revenue; and he thought this was a wise plan, in the interest of the consumers, as well as in that of the Company. It was no good to keep jumping up and down in the price of gas—first of all to put the price down for the sake of a little popularity, and then to be obliged to go back again to the higher figure. What the Board wanted to do was to work so that they might bring about a permanent reduction in the price of gas. The consumers had every confidence in the Company, for this reason: At the time of the coal famine two or three years ago, almost every Metropolitan Company, and most of the Suburban Companies, raised their price for gas. The Brentford Company, however, did not do so; and he thought they had reaped the benefit by gaining the confidence of the authorities in the district, and also of the consumers. They knew very well that the Directors would reduce the price of gas at the earliest possible moment that they could do so with a reasonable prospect of its being permanent. The result of their business was that they had made a profit for the half year sufficient to pay the dividends recommended and to leave a surplus of over £5000. At the previous meeting he told the proprietors that the Company had not any insurance fund, but that he hoped to be able to say something more about the matter next time he met them. It had been the intention of the Board, having a surplus of £5000, to start such a fund, which was very necessary to gas companies at the present time. They were exposed to all sorts of risks, with electric cables, electrolysis of mains, and the carelessness of people who had to deal with stoves and automatic meters; and it therefore became most desirable that an insurance fund should be established. Well, as he had said, the Directors had intended to put £5000 to the credit of an insurance fund this half year, as they had it in hand. Their practice, however, had been always to make up their accounts to Dec. 31; and when they came to look at their Provisional Order of 1881, they found that the provisions with regard to an insurance fund were as follows: "If the clear profits of the undertaking of the undertakers in any year amount to a larger sum than is sufficient to pay the prescribed rates, the excess beyond the sum necessary for that purpose may from time to time, to the extent of 1 per cent. per annum upon the paid-up capital of the undertakers, be invested in government or other securities, and the dividends and interest arising from such securities shall also be invested in the same or like securities, in order that the same may accumulate at compound interest, until the fund so formed amounts to a sum equal to one-twentieth of the paid-up capital of the undertakers, which sum shall form an insurance fund to meet any extraordinary claim, demand, or charge which may at any time arise against, or fall upon, the undertakers from accidents, strikes, or other circumstances which, in the opinion of a justice, due care and management could not have prevented; and if such fund be at any time reduced, it may thereafter be again made up to the said sum, and so from time to time as often as such reduction happens." Under these circumstances, therefore, they thought it better to add the money to the undivided profits for the half year; but next Christmas it would be allocated to the insurance fund, along with any further sum that might be available. They were entitled to put aside for this purpose up to 1 per cent. of the paid-up capital of the Company; and as the paid-up capital was £903,080 (without including the debenture stock), they would be able to place to the credit of the insurance fund over £9000 in one year. He concluded by moving—"That the report and accounts be received, adopted, and entered on the minutes."

Mr. Ulick J. Burke seconded the motion.

Mr. Hughes asked whether the Company did not already insure the buildings and plant against fire.

The Chairman replied that they did; but this was not what the new fund was intended for. It was to provide for accidents in the district—explosions, and things of that sort.

Mr. Oke suggested that, as there was a surplus in hand, the dividends should be paid free of income-tax. He mentioned the names of several companies who did this.

The Chairman said he thought 12 per cent. and 9 per cent. were very liberal dividends, even if income-tax was deducted. They were entitled, at the present price of gas, to divide another ½ per cent.; but they did not do it, because they thought it better to have the money in the reserve fund. They had been very anxious for a long time to form such a fund; and now they had a very nice little amount of £18,800. He supposed they would add another ½ per cent. to that during the current year, if nothing unforeseen happened.

The motion was carried unanimously; and thereafter dividends were declared at the rate of 5 per cent. per annum on the preference stock, 12 per cent. per annum on the consolidated stock, and 9 per cent. per annum on the new stock.

Mr. H. D. Ellis proposed, and Mr. Hughes seconded, a vote of thanks to the Chairman, the Directors, and the staff.

The Chairman, in acknowledgment, said he hoped a certain amount of the success of the Company was due to the efforts of the Board; but the greater part of it was due to the efficiency and intelligence of the officers.

CRYSTAL PALACE DISTRICT GAS COMPANY.

Half-Yearly Report and Accounts.

The greater portion of the report which will be presented at the half-yearly meeting of the above-named Company next Friday is devoted to an explanation of the circumstances which led to the withdrawal of the Company's Bill at almost its final stage, as recorded in our "Parliamentary Intelligence." The proprietors are informed that the Bill was promoted "for getting relief from various onerous and needless restrictions, which would have enabled the Company to avoid the nuisance due to the use of lime for purification, to save the cost of useless enrichment, and would have resulted in a reduction of 2d. per 1000 cubic feet in the price of gas, amounting to over £10,000 a year to the consumers." The Bill was passed by a Committee of the House of Commons; but it was so altered by a Commtttee of the House of Lords that the Directors withdrew it. The report says: "The London County Council took the lead in the opposition, without warrant from the consumers, and with very questionable evidence completely misled the Committee. The case of the Company was so strong, and the success in the House of Commons so encouraging, that the Directors feel it would be both unwise and cowardly to give up the attempt to obtain the necessary freedom to carry on their business without detriment to the neighbourhood of the gas-works, and to supply the consumers with the article they need at the lowest possible price." The Directors express their pleasure in stating that very nearly all their employees are, through the profit-sharing system, shareholders in the Company; their holding amounting to some £18,000, or an average of more than £30 per man. They say that the result is "cheerful and loyal service, which produces the most satisfactory relations between employers and employed."

The accounts accompanying the report show that a sum of £4953 was spent on capital account in the six months ending the 30th of June; bringing up the total expenditure to £774,430, and leaving an unspent balance of £13,985. The revenue from the sale of gas was £81,080; meter and stove rents produced £4931; the sale of residuals, £24,070; and the total receipts were £110,149. The expenditure on the manufacture of gas came to £63,478 (coal costing £37,483, oil £3910, and coke for making oil gas £2568); on distribution, to £12,018; on management, to £4080; and other items (including £1005 for profit-sharing) made up a total of £86,897—leaving a balance of £23,252 to go to the net revenue account. The result of the half-year's working is sufficient profit to allow of the payment of the same dividend as the last, the addition of £2400 to the recently created insurance fund, and the increase of the balance carried forward by £1023 17s. 4d.; making it £2678. The insurance fund will then amount to some £5400. The Directors recommend a dividend at the rate of 5½ per cent.; leaving undivided the small amount of £119 15s. 10d., which it is proposed to add to the reserve fund, bringing it up to £39,147.

The working statements show that 50,003 tons of coal were carbonized and 393,001 gallons of gas oil and 340 gallons of carburine were used to produce 515,150,000 cubic feet of coal gas and 155,088,000 cubic feet of oil gas of 17¼-candle power—670,238,000 cubic feet. Of this quantity, 631,122,000 cubic feet were sold and 638,677,000 cubic feet accounted for. The estimated quantities of residuals produced in the half year were: Coke, 620,282 cwt.; breeze, 15,278 yards; tar from coal, 526,461 gallons; tar from oil, 40,236 gallons; ammoniacal liquor, 10,058 butts—the quantity of sulphate of ammonia manufactured being 425 tons. There were 156,737 cwt. of coke and 9213 yards of breeze used in the manufacture of coal gas, and 70,687 cwt. of coke and 1414 yards of breeze for producing oil gas.

PROVINCIAL GAS AND WATER COMPANIES.

We commence to-day our usual notice of such points arising out of the meetings of Provincial Gas and Water Companies as may be thought of special interest to the general body of our readers.

Gas.

Reduction in Price at Cambridge.

In the report which was presented at the half-yearly meeting of the Cambridge Gas Company on the 31st ult., the Directors recommended the payment of the maximum dividend. They also stated that, owing to the more favourable contracts which had been entered into for the supply of coal during the ensuing year, they had been able to reduce the price of gas to 3s. per 1000 cubic feet from the end of the past quarter. During the six months, a system of supervising incandescent burners had been adopted, under which the Company, for a small sum per annum, undertook to keep such burners in an efficient state. This arrangement has already met with a fair amount of support. In proposing the adoption of the report, the Chairman (Mr. E. H. Parker) said it had been satisfactory to the Directors to be able to reduce the price by a further 2d. per 1000 cubic feet, notwithstanding the fact that the average price of coal on this year's contract was 16s. 5d. per ton, as against 14s. 5d. in 1898. It was no doubt partly due to the good price which had been realized for coke and other residuals; but some credit might be fairly taken for the careful working and improved methods of the Company. With regard to the revenue account, which revealed the prosperity of the Company, he need only point to the very satisfactory balance of £7727 which they had been able to carry to the profit and loss account, and which, after paying the dividend and fixed charges, would leave a creditable figure of

£1759 to be carried to the net revenue account. Last year they did not quite earn their maximum dividend and fixed charges; the deficiency being £230. If they deducted this from the £1759, they would see that the Company had been able to pay the maximum dividend and all the fixed charges, and still have £1529 to the good on the financial year. The statements of gas made and sold also disclosed the pleasant fact that the output was steadily increasing. The only unsatisfactory feature was the item "unaccounted-for gas;" but the Directors had this matter constantly before them, and were making every effort to reduce the loss. The half year had given an increase of 23 in the number of ordinary consumers, 125 in ordinary cookers, 157 in slot meters, and 152 in slot cookers. He thought the shareholders would agree that in these days of electric light and other competition, this was not at all a bad result. In conclusion, he spoke in appreciative terms of the work of the Engineer and Manager (Mr. J. W. Auchterlonie) and of the Accountant (Mr. S. G. Wheaton). The report was adopted; and it was subsequently agreed that the salary of the Secretary (Mr. A. E. King) should be increased from £150 to £200 per annum.

Good News for Consumers at Cardiff.

The Chairman of the Cardiff Gas Company (Mr. C. H. Williams), in moving the adoption of the report at last week's meeting, congratulated the proprietors upon the satisfactory condition of the undertaking, and the excellent progress that had been made during the half year. A large number of new consumers had been added to the books, mainly on the prepayment meter system, which was working with great success, and would eventually prove an important auxiliary to the ordinary method of gas consumption. Considerable outlay would be incurred in establishing this system throughout the district; and the necessary capital had been provided by the issue of debenture stock sanctioned at the last meeting. With regard to the charge for gas, he might say that the Directors had this question constantly before them, believing that the more the price could be brought down the better it would be for the Company. They had been able to secure some little reduction in the price of coal for next winter's supplies, and there was also a prospect of some improvement in residual products; and thus they felt justified in announcing that from Sept. 29 they would reduce the charge for gas throughout the whole of the district by 2d. per 1000 cubic feet—bringing the rate down to its old level. The report was adopted; and a hearty vote of thanks was passed to the Engineer (Mr. Henry Morley) and to the Secretary (Mr. George Clarry) for their able management of the business.

A Record Half Year at Derby.

At the meeting of the Derby Gas Company on Friday, the Chairman (Mr. H. Swingler, D.L.) had an excellent account to give of the progress of the undertaking in the six months ending June 30. There was an increase of 750,000 cubic feet on the quantity of gas sold to private consumers, bringing it up to 270,626,000 cubic feet, though there was a drop to about the same extent in the public lighting, owing to the adoption of incandescent burners. The receipts for gas amounted to £37,148, being a rise of £84; residuals, especially sulphate of ammonia, produced a satisfactory return; and the total revenue came to £49,130. The expenditure on coals was less by the substantial sum of £1732; the quantity carbonized being 27,527 tons, from each of which 10,493 cubic feet of gas were sold. Wages were lower by £186, and repairs and maintenance by £1238. Rates and taxes unfortunately were higher by £335. For the half year ending June, 1901, the rates were £1261; now they were £1900—a rise of rather more than 50 per cent. The total expenditure was £32,670, against £35,081 for the corresponding half of last year; being a decrease of £2411. As there was an increase in the revenue to the extent of £581, the profits exceeded those for the first half of 1902 by £2992. The actual balance carried to the profit and loss account was no less than £16,460, compared with £13,468. From this sum, £946 had been paid for interest on debenture stock and £32 interest on deposits; leaving £15,482, to which had to be added £102 received for bank interest, making a total of £15,584. Mr. Swingler stated that this was the largest sum available for dividends which the Company had ever had in any half year. After the statutory dividends had been paid, it would leave a sum of rather more than £5000 to carry forward. Following this gratifying statement, the Chairman gave the proprietors some particulars as to the Company's Bill, under which the limits of supply will be extended, the capital consolidated and increased, and the sliding-scale applied to price and dividends. The Company will also have power to deal in engines and other appliances whereby the use of gas will be extended. In view of the past successful half year, Mr. Swingler announced a reduction, as from next month, of 2d. per 1000 cubic feet in the case of gas used for lighting purposes, making it 2s. 6d. to 2s. 1d., according to consumption; and of 3d. per 1000 feet (from 2s. 3d. to 2s) if used for power. He concluded by moving the adoption of the accounts submitted, and the payment of dividends at the rates of 10, 7, and 5 per cent. per annum. The motion was carried unanimously. A pleasant incident of the proceedings was the addition of £50 per annum to the salary of the Secretary (Mr. H. Bullivant). The Company's Engineer (Mr. J. Ferguson Bell, Assoc.M.Inst.C.E.) is to be heartily congratulated on the results he has achieved. His return for residuals is 39 per cent. in money value more than it was in the corresponding half of 1902, and works out to 65½ per cent. on the cost of coal, which (less residuals) is 4·43d. per 1000 cubic feet of gas. The surplus on the half year, after paying full dividends and interest, is 4·63d. per 1000 feet sold.

Gas Supply at Newport (Mon.).

In the six months ending the 30th of June, the quantity of gas consumed by private persons at Newport (Mon.) was 145,629,400 cubic feet, which produced a revenue of £25,391. Adding the public lighting, this sum is brought up to £27,087. The total receipts, as shown by the accounts presented at the meeting of shareholders last Wednesday, were £33,479. The expenditure having been £24,535, there was a balance of £8944 to go to the profitand loss account, on which there was £7633 available for distribution. The Chairman (Mr. R. Laybourne), in moving the adoption of the report and accounts, said that considerably more gas had been made during the half year than in the corresponding period of 1902. The report was adopted, and the usual dividends were declared. The Company's Engineer (Mr. Thomas Canning, Assoc.M.Inst.C.E) presented a satisfactory report upon the condition of the works; and he and the Secretary (Mr. T. H. Hazell), as well as the staff, were thanked for their services.

Comparison of Gas and Electric Light in York.

In the course of the remarks made by the Chairman of the York Gas Company (Mr. J. R. Hill, J.P.), when moving the adoption of the report presented by the Directors at the half-yearly general meeting last Thursday, he alluded to the lighting of the streets, in which, he said, the proprietors were interested in the twofold capacity of gas suppliers and ratepayers. Referring to a remark reported to have been made by the Chairman of the Electric Light Committee of the Corporation, to the effect that, as a matter of fact, "the electric light, for the amount of light given," was really cheaper than gas, Mr. Hill said this conclusion had been arrived at by some extraordinary manipulation of figures which it was impossible to understand; and he did not hesitate to assert that it was entirely contrary to experience. They had it on the admission of the Chairman himself that the charge to the city for each electric arc lamp was £17 per annum, and there were 66 lamps; the total cost to the city being £1122 per annum. If the gas-lamps displaced by these electric lamps had been lighted with incandescent burners, the total cost per annum would be £622; therefore, the city was spending £500 more for lighting the streets than the Company could do it for, and yet the area covered represented only one-eleventh part of the whole city. This was a plain statement of figures which anybody could understand, and nobody controvert. As to the comparative efficiency of the two systems, it seemed to be claimed that the electric lamps in the bulk gave very much more light, measured by candle power, than the displaced gas-lamps in the bulk. Possibly this might be so. But they might have thousands of candle power concentrated in one electric lamp which would not light round the bend of a street, and would not light equally and effectively the whole length of the street; for it was well known that the electric light would not diffuse itself as gas light did. The consequence was that with far less total quantity of gas light (measured by candle power), properly distributed, they could get very much better practical results than in the widely separated electric lamps with highly concentrated lights; and the comparison of cost he had given them spoke for itself. Mr. J. Melrose seconded the motion, which was carried. The net profit for the half year was £8845; and a dividend at the rate of 4 per cent. per annum upon the preference and consolidated stocks was declared.

Water.

Jubilee of the Cambridge Water Company.

When presiding over the recent meeting of the Cambridge University and Town Water Company, the Rev. Dr. Perowne called attention to the fact that they were in the jubilee year of the undertaking. He said that it was on the 14th of June, 1853, that their first Act of Parliament received the Royal Assent; and the works of the Company at Cherryhinton were opened for the purpose of supply on Oct. 27, 1855. When the works were started, it was intimated that they would be sufficient for a population of 28,000. At the present time they supplied 13,256 houses, besides colleges and public institutions; and they had an estimated population, not of 28,000, but of 57,000. To meet such demands a very efficient organization was required; and it had been the endeavour of the Directors to make the supply all that it should be, both as to quantity and quality. With regard to financial matters, the first dividend was paid in 1859; and a full dividend was first paid in the second half of 1874. Notwithstanding the very large amount which had since been expended on capital account, they were very glad to observe that the maximum dividend had been paid uniformly from that time to the present. In 1874, the rental of the Company amounted to £5002; now it was £20,152. So that in the nineteen years the income had quadrupled. In 1874, the daily average quantity of water supplied was 517,000 gallons; in 1903, it was 1,534,000 gallons. The report was adopted, and dividends at the rate of 10 per cent. per annum on the consolidated stock and 7 per cent. per annum on the new shares were declared.

A Growing District in the Colne Valley.

The Directors of the Colne Valley Water Company had a very good report to present to the proprietors who assembled at the half-yearly meeting held at the pumping-station, Bushey, last Tuesday. In the six months ending the 30th of June, a sum of £2308 was expended on capital account; the greater part being for extensions of mains, mostly at Wembley and in the Edgware Road, to provide for the increasing population in these districts. Additional mains are required at Harrow and Radlett, which are growing considerably as residential places. It is not surprising, therefore, to find that the Company's revenue from water-rates in the past half year was £14,869, compared with £13,671 in the corresponding period of 1902. There was a profit of £9051 transferred to the dividend and interest account; and after placing a further £500 to the contingency fund account and paying the usual interest on the debenture stock and preference shares, there remained a balance of £8106. From this, dividends at the rate of 7½ per cent. per annum on the original and new shares (1885), and 7 per cent. per annum on the new shares issued under the Act of 1873 were declared, and a sum of £532 was carried forward.

Steady Progress at Leatherhead.

Colonel Gleig, who presided over the meeting of the Leatherhead and District Water Company last Thursday, had very little to do besides congratulate the shareholders on the steady progress made by the undertaking. Not only had the expenses at the works for the six months ending June 30 been less than in the corresponding period of the previous year, but they were also lower than in the half year to Christmas. The accounts showed an increased profit of about £200; and during the year 66 new services were laid on, from which an additional rental of £210 per annum was anticipated. The report and accounts showed that the receipts for the six months amounted to

£3411, and the working expenses to £2070—leaving a profit of £1341. To this had to be added £992 brought forward from the previous accounts, making a total of £2333. Deducting from this sum £187 for interest on debenture stock, there remained £2146 available for division among the shareholders. The Directors recommended a dividend at the rate of 6 per cent. per annum, which would absorb £1064, and leave a balance of £1082 to be carried forward. In his separate report, the Engineer (Mr. F. S. Cripps) stated that during the six months the water supply, both as regarded quality and quantity, had been satisfactory. About 5300 yards of new mains had been laid; and, owing to the rapid increase in the demand for water and the opening up of new estates, an 8-inch main was at present being laid in the Kingston Road. A new boring has been sunk at the works, and yields an abundant supply of water. This has been lined with iron tubes, driven well into the chalk, and is connected by a syphon-pipe with the pump-well. A large air-vessel will shortly be fixed on the 12-inch rising-main, to steady the flow of water through the distributing pipes.

BROUGHTY FERRY CORPORATION GAS-WORKS.

Dismissal of the Manager.

A Special Meeting of the Broughty Ferry Town Council was held last Tuesday, for the purpose of considering a motion, of which notice had been given by Bailie Lindsay, relating to the management of the gas undertaking. Provost Gray presided.

The Clerk submitted a letter from Messrs. Watt, Bissett, and Co., Solicitors, of Dundee, to the effect that they had been consulted by Mr. Forbes Waddell, the Gas Manager, with regard to a statement in the report furnished by Mr. Herring (*ante*, p. 254) concerning the quantity of coke available for sale in 1903 as compared with 1902 and 1900. Mr. Waddell, the communication stated, maintained that the figures for 1902-3 were considerably understated; and his Agents desired that publicity should be given to this disclaimer.

Bailie Lindsay said, before proceeding, he wished to propose that, if Mr. Waddell were present, it would only be fair to give him an opportunity of making a statement.

Mr. Christie objected, for the reason that it would be unfair to ask a man to make a statement with a rope round his neck. He should have been asked to do this before.

Mr. Park seconded the proposition.

Bailie Kidd contended that this was a matter that concerned the Council; and his opinion was that the time for such a proposal had passed. It would be unjust. He therefore moved, as an amendment, that Mr. Waddell be not called in.

Provost Gray seconded the amendment. He said Mr. Waddell was asked for an explanation before the employment of an expert was considered; and he made a statement which was not thought satisfactory. The Council then resolved to have the best advice in the land to guide them. Mr. Waddell had had an opportunity of meeting the expert and answering his statements; and there was no need for the Council to drag anything from him just now. To do so would be to put him on an equality with the expert, which they would never dream of doing.

The motion was withdrawn.

Bailie Lindsay then submitted the motion of which he had given notice, which was as follows: "That the services of Mr. Forbes Waddell, as Gas Engineer and Manager and Engineer and Manager of the Electricity Department of the Town Council, and in all and every office held by him under the Town Council, be dispensed with as from and after the 4th of August; and that he be allowed three months' salary from the said date in lieu of warning, and in full of all claims of any kind at his instance against the Town Council." He said the motion was really one from the Gas Committee, and it represented their opinions and feelings in the matter. The position in which they found the gas-works at present was really the outcome of two causes. The first was the past policy of the Town Council—and he said this because he did not think it was fair that all the blame should be put upon Mr. Waddell, who had enough to bear—and bad management at the works was the other. Some time ago, there was adopted by a portion of the Council what was called a "forward policy." The party advocating it did their utmost to increase the use of gas. This policy was opposed by another party in the Council, who wished to discourage the use of gas as much as possible, in view of the fact that they were face to face with the introduction of the electric light. They knew that the probable effect of the electric light would be that the demand for gas would diminish. It was the forward policy, however, that prevailed; and the result was that, even before the electric light was installed, the consumption of gas had increased so much that they were obliged to go in for a large extension of the gas-works. He regarded the position in which they found themselves at present as a complete vindication of the policy advocated by Provost Gray as against that advocated by Bailie Christie and his Committee. With regard to the management, their first intimation of the state of affairs was when the Town Chamberlain made his annual statement to the Council, when it was found that they had gone back £2200 in one year. So serious was the position, that they resolved to call in an expert; and Mr. Herring was chosen unanimously. There was no word then said that Mr. Herring might be biased or prejudiced. Referring to Mr. Herring's report, Bailie Lindsay proceeded to show that it dealt with three questions. After making certain deductions from statistics supplied to him of the operation of the gas-works during the last five years (and anyone whom they employed for such a purpose could not possibly have made any other deductions), the second question the expert took up was the actual position of the works; and the third consisted of suggestions for their future guidance. In general terms, they were to the effect that during last year Mr. Waddell carbonized 9686 tons of coal, compared with 7881 tons in the previous year—that was to say, he used 1805 tons more for the manufacture of a million cubic feet of gas less. It pointed to neglect and carelessness in the management of the works. Any servant or employee could be careless, and yet he might be forgiven; but they had a much more serious charge to bring against Mr. Waddell While dealing with charges against the Manager, he wished to say that he was greatly horrified to learn that in some quarters it was believed that the Committee actually had suspicions as regarded Mr. Waddell's honesty. He did not believe anyone in the Council ever entertained the faintest idea that Mr. Waddell had done anything in the slightest degree approaching dishonesty or fraudulency. There was, however, a sufficiently serious charge against him, and that was the want of straightforwardness. In this connection he might give two instances. About a month or six weeks ago, at a Council meeting, Bailie Sim asked the Manager if there was any truth in the report that the new retorts were in such a bad condition that the gas was escaping into the flues. In reply, Mr. Waddell stated that there was not the slightest word of truth in it, and that the retorts were in good order. A fortnight later, as they knew, when Mr. Herring came and opened the retorts, it was patent to all of them that they were in a very bad condition. Mr. Waddell must have known perfectly well what the state of the retorts was; and he (Bailie Lindsay) was convinced that he did know. Again, in May, when preparing the estimates, Mr. Waddell took stock of the coal and coke at the works. His figures were laid before the Auditor; but that official declined to accept them unless they were checked. He was willing to accept a check by Mr. Winning, the Burgh Surveyor. The figures were: Mr. Waddell's estimate, 1470 tons; Mr. Winning's, 969 tons—a difference of 501 tons; Mr. Waddell's estimate, 1380 tons of coke; Mr. Winning's, 660 tons—an over-estimate on the part of Mr. Waddell of 720 tons. These two together brought out something like £650 of a difference in value. The Council might think these were small matters; but he considered they formed a most important part of this sorrowful business. A man could not make statements like these without altering the relations between the Council and the officials; and he did not see how they could possibly go on with the man who had given them the impression that he was not dealing fairly with them. With regard to the future, Mr. Herring advocated a change in their methods of making gas; and he (Bailie Lindsay) asked them if it was at all likely that these suggestions would get a fair trial from a man who controverted almost every suggestion Mr. Herring made. His motion meant the acceptance of Mr. Herring's report, or the alternative to go back to Mr. Waddell and the "forward policy" of making gas out of dross. During his time on the Council, the continual and incessant complaints of bad gas had been an intolerable nuisance to him; and they ought to make a trial of producing good gas. To his mind, there had been an insane rivalry on the part of gas engineers in Scotland to see who could make the cheapest gas. It was time to stop this competition so far as Broughty Ferry was concerned. He concluded by saying that his present position had been very painful to him, and by paying a tribute to Mr. Waddell's kind and obliging disposition.

Mr. Anderson seconded the motion. Referring to the erection of the new retort-house, he reminded the Council that when they came to the resolution to extend the works and procure appliances of a modern kind, they decided on an expenditure of £5000; but in the end the cost was £8000. It was, in his opinion, quite unwarranted on the part of the Manager to exceed to such an extent the minute which was there for his guidance, without informing the Council of the fact. Without confidence in the Manager of a concern the turnover of which was about £11,000 a year, they could not possibly go on.

Mr. Gillies moved, as an amendment—"That, in view of the fact that Mr. Waddell has not had an opportunity of being heard on Mr. Herring's report, and as a section of the Town Council did not choose to consider his own statement, that some man of undoubted ability, such as Mr. Wilson, of Dawsholm, or Mr. Yuill, of Dundee, be requested to place Mr. Waddell's case before the Council." His reason for making such a proposal was that he felt that Mr. Waddell had not been fairly treated. To his mind, the question was: On whom rests the onus? He said quite frankly that it was not on Mr. Waddell. Every man there was directly, in one way or another, to blame. There was no councillor who did not have his minutes, in which the accounts for the extension were passed; and it was his duty to check them, and tell Mr. Waddell he was going too far. The Council in this respect were more to blame than the Manager. Mr. Waddell had certainly had a bad year, due not altogether to his own carelessness. In all fairness to him, they were bound to admit that while the extension was proceeding he had to carry on the work without a roof over his coals. If the Council did their duty, they would resign *en bloc*, and leave Mr. Waddell in charge.

Mr. Sim seconded the amendment. He said he did not think that Mr. Waddell had had fair treatment from the expert; and he also complained of the treatment of the Council by the Special Committee, from whom no information had been received to warrant them in dismissing Mr. Waddell. He appealed to the Council to be charitable, and not put their heel on the man's neck when he was down. No matter whom they got as Manager, gas affairs would always be a sore question in Broughty Ferry.

Mr. Westwood supported the motion. He said he had always been an opponent of the forward policy, and had prophesied that the Council would come to the stage they had now reached.

Bailie Kidd pointed out several of the disadvantages under which the Manager had been working during the past year, instancing the transitional state of the gas undertaking and the establishment of the electric light works. Criticizing several of the points in Mr. Herring's report, he wondered why they should get such good results from small coal last year when Mr. Herring condemned it; and he considered if the whole report was on lines of this sort, he could not place very much reliance upon it. In view of the very grave nature of the charges against Mr. Waddell, he should have had a copy of the expert's report sent to him, and been given an opportunity of replying to it. He (Bailie Kidd) did not altogether free the Manager from some carelessness in certain matters. But his dismissal meant his ruin; and that was a very serious matter.

Mr. Sturrock reviewed the position, and concluded by saying that with a man in whom the Council had lost confidence he could not see how it was possible to carry on the work.

Mr. CHRISTIE took exception to Bailie Lindsay's charge that the situation was brought about by the forward policy of the Council. They agreed to proceed with the extension of the works; but the advantage was in a large measure counteracted by the other section of the Council, who continued in their policy of trammelling and hampering the output of gas, and who, by still continuing to do so, kept Broughty Ferry from keeping up with other places in which electric light had been introduced, and in which other outlets had been found for gas. When Mr. Herring's report was received by the Council, he suggested that Mr. Waddell should have a copy, which was agreed to; and it was remarkable that the Committee, who had been so very antagonistic to the Manager, did not furnish him with it. He proceeded to criticize various details of Mr. Herring's report, and, remarking that Mr. Waddell claimed that it was composed of figures not supplied by him, contended that an injustice had been done to the Manager, because he had not had an opportunity of defending himself. It would be a disgrace to the fair name of Broughty Ferry were they to discharge and demean Mr. Waddell in his profession simply because he had had a bad year's results. The improvements had been schemed, scheduled, superintended, and started by Mr. Waddell; and he doubted not that they would become in time a source of financial benefit to the town, and a monument to his skill as an engineer.

Provost GRAY said what had struck him in the course of the discussion was that those supporting the amendment had drifted from the main point into side issues, or at least taken up very unimportant parts of the report. Had it been simply a question whether Mr. Herring or Mr. Waddell was right about a certain class of coal being the best for use, he would not have cared who was right. No member of the Council would have thought of dismissing a man for anything of that kind. They had lost confidence in their Manager, in his abilities, and in his performance of his duties.

On a division, eight voted for the motion, and four for the amendment. The motion was therefore carried.

ALLEGED IRREGULARITIES AT STOCKTON GAS-WORKS.

In July last year, considerable stir was occasioned in Stockton-on-Tees by a libel action arising out of statements contained in pamphlets issued by a Mr. Ordish which reflected on the conduct of a member of the Corporation. The case, which was briefly noticed at the time [see "JOURNAL" for July 29, 1902, p. 287], resulted in a verdict for the plaintiff, with £175 damages. Immediately after the trial, the Corporation instructed the Gas Committee to institute an exhaustive inquiry into certain alleged irregularities at the gas-works which came out in the evidence in the action; and the Committee's report was considered at a special meeting of the Council on the 30th ult. The matters which they were ordered to inquire into were (1) the employment of Corporation workmen outside the gas-works, (2) the use of Corporation materials by the same, (3) as to the sale of block tin and other scrap, and (4) the laying-in of gas-pipes. The conclusions of the Committee, which they asked the Council to adopt, were as follows:—

As to the employment of Corporation men outside the gas-works. In regard to this matter, the Committee find that it has been the custom to lend men from the gas-works to do work outside the works, but within the area of supply, for large firms, neighbouring authorities, and private individuals. But in all these cases, the wages have been provided by those employing the men, and not by the Corporation. In October, 1901, a case was brought to the notice of the Gas Committee where men had been lent outside the area of supply; and verbal instructions were at once given to the Gas Manager to discontinue the practice. But we recommend that a resolution to the following effect should be placed on the minutes of the Council: "That in future no Corporation men employed at the gas-works be lent to do work for outside authorities or private individuals without the consent of the Gas Committee."

As to use of Corporation materials by the same. In respect to this, we find that in all cases where Corporation materials have been used they have been charged to the persons using them at a profit to the Corporation, except in one instance, where a few pennyworth of spun yarn was accidentally used.

As to sale of block tin and other scrap. In regard to this, we find that the usual custom is to ask prices from different persons, and to sell the scrap to the highest bidder, if, in the opinion of the Gas Manager, the offer is at a fair market price. Your Committee went most searchingly into the particular transaction *re* block tin with which Councillor T. B. Watson's name was concerned, and, though of opinion that Mr. Watson acted most unwisely in allowing the block tin to remain on his premises, no matter through whose agency it came there, they find that the best price obtainable at the time was paid.

As to the laying-in of gas-pipes. The Corporation lay all pipes from the main to the inside of the house or boundary wall free of cost; and as to pipes laid from thence to the meter, we find that three systems are in vogue—viz.: (*a*) Where the plumbers lay their own pipes in; (*b*) where the Corporation lay the pipes supplied by the plumber; and (*c*) where the Corporation supply the pipes, lay them in, and charge the plumber with the cost. The Gas Manager favours the third system, on the ground that he is sure of the pipes being good, and that it is more economical and better for the Corporation to do the laying of all pipes from the main to the meter. Whenever any pipes have been laid and supplied by the Gas Manager, we find that proper charges have been made for both the work and the pipes.

Alderman Hind, the Chairman of the Committee, said there was one thing of which they had to be glad, and that was that the Gas Manager (Mr. William Ford) had come out clean in the business. An amendment was moved that the report should be referred back for further consideration; but, on being put, it was lost by 18 votes to 7. A second proposal to refer the report to the Council in Committee failed to find a seconder; and ultimately the report was adopted—only five members voting against it.

WET V. DRY GAS-METERS AT BELFAST.

The question of the supply of dry meters to those gas consumers who prefer them was again before the Council of the County Borough of Belfast last Tuesday, when Mr. Andrews, in moving the adoption of the minutes of the Gas Committee, said he desired to add something to the resolution passed in March (see "JOURNAL" for April 7, p. 37). It was originally resolved that consumers should be allowed the option of having dry meters without payment of a deposit, but that such option should only be exercisable on changes of existing meters being found necessary by the department or in the case of first supply of a meter to a new house. The clause he wished to add was to the effect that if any consumer insisted on a dry meter (the existing wet meter being certified by the officials to be in efficient working order), the same should be supplied on his paying half the cost. Mr. Andrews said this was an endeavour to meet a difficulty which had arisen through the hands of the officials being tied. A consumer wished perhaps—generally on account of the defective gas fittings in his premises—to have a dry meter. He applied to have one fitted, and was told that he could not be supplied because his wet meter was in efficient working order. It was a great hardship on many consumers who were willing to pay a deposit, and who in some instances were willing to buy a dry meter, and have it fitted; and it was to meet this anomaly that the words were added. He did not think this would entirely take them out of the difficulty, because there would be a considerable amount of friction raised by the power which was left in the hands of officials to declare whether a meter was in efficient working order or not. But the position would be more intelligible and easier to face than at present. The issuing of wet or dry meters as applicants chose, involved financial undertakings of such magnitude that he hoped the Corporation would accept the words proposed, and so avoid raising the larger and more serious question. It was sufficiently serious even now; and they would probably have to spend twice as much on meters as was hitherto the case. Instead of spending £4000 a year on meters, as they had been doing for the past six years, they would have to spend £10,000; and £6000 out of the gas profits would greatly lessen the amount available by the Corporation for the public good. The proposal was agreed to.

LONGTON GAS AND ELECTRICITY SUPPLY.

The Past Year's Working.

The report of the Gas and Electricity Committee of the Corporation of Longton for the year ending the 31st of March last was recently presented to the Town Council by the Chairman (Alderman A. S. Walters). We learn from it that the total make of gas was 149,089,000 cubic feet, of which 24,250,000 cubic feet, or 16·2 per cent., was carburetted water gas. The gas sold for private consumption was 119,727,000 cubic feet, for public lighting purposes 18,251,000 cubic feet, and used on the works 1,677,000 cubic feet; making a total of 139,655,000 cubic feet, and leaving a loss through leakage, condensation, &c., of 9,434,000 cubic feet, or equal to 6·3 per cent. of the total make. The leakage is 2 per cent. less than in the preceding year; and this accounts for the fact that, though there was less gas made, the sale increased by 1,400,000 cubic feet. There was an increase of 308 in the number of slot consumers; making a total of 3324. The average consumption of gas per slot consumer was 12,180 cubic feet per annum; the total amount received from slot meters during the year being £7350—an increase of £608. There are 61 gas-engines in use in the town; the consumption from this source for the year being 7,701,000 cubic feet, or an average of 126,000 cubic feet each. The Council last year reduced the price of gas for motive power by 6d. per 1000 cubic feet; but as many of the gas-engines in use were not under a separate supply, the increased consumption could not well be ascertained. New meters have now been fixed to each engine, so that in future the Committee will be able to compare year by year the quantity of gas used for motive power purposes. There were 300 cottages supplied with free fittings; and small cookers were also fixed when required. There was a great demand for cooking and heating stoves during the year; the number in use on the 31st of March being 1510, against 1204 at the corresponding date in 1902—an increase of 306.

The accounts of the two departments show that the manufacture of gas entailed an outlay of £11,971, of which £2540 was for repair and renewal of works (including £1000 towards the cost of the carburetted water-gas plant); distribution cost £2867, in which amount is comprised £1313, the cost of new meters and mains; and the total expenditure was £19,417. The revenue from the sale of gas was £23,395; from residuals, £4215; and the total receipts amounted to £27,861. The balance carried to the net revenue account was £8444, from which the interest and payment to the sinking fund, also the bank interest, had to be deducted—in all £6274. This left a balance of £2170 as the net profit. The Committee recommended that £2000 of it should be paid over to the borough fund account, and that the remainder should be placed to the credit of the electricity account, the working profit on which for the year amounted to only £704. As the interest on the capital sunk came to £875, and the proportion of the sinking fund to £548, there was a deficit of £719. Adding the balance brought forward (£426), there was a total of £1145 to be carried to the account for the current year. This department of the Corporation's work is, however, improving, as during the past year there were connected, in incandescent and arc lamps, motors, &c., an equivalent of 1112 8-candle power lamps; bringing up the total to 4322 lamps. The Committee consider the results of the year's working most gratifying; the yield of gas per ton of coal (11,070 cubic feet), and the quantity sold (10,306 cubic feet), making it a record year. The works and plant were well maintained without any addition being made to the capital account. In fact, during the past four years, the Committee have successfully kept this account from increasing by

paying for mains and meters out of revenue, having realized the fact that the concern was suffering from too much capital. Though the working profit for last year is given as £8444, it was really £10,757, seeing that £2313 was used in paying for mains and services and the carburetted water-gas plant, as already mentioned. The Engineer and Manager (Mr. W. Langford) was complimented on the good results he had achieved.

PUBLIC LIGHTING OF WEST BROMWICH.

At a Meeting of the West Bromwich Town Council last Wednesday, a long discussion took place with regard to the recommendation from the Highways Committee for the better lighting of the streets, at a cost of £600 per annum, referred to in the "JOURNAL" last week. It was pointed out that the Electricity Committee had offered to put on 40 tramway poles, which ran down the centre of High Street, two arc lamps, each to give a light of 1000-candle power. The original quotation of the Committee was £800; but they had agreed to allow a rebate of 25 per cent. out of the profits made, which brought the net cost down to £600. The Chairman of the Gas Committee (Mr. Wilson) considered that sufficient facts were not before the Council to enable them to arrive at a decision on the matter. He said he was afraid an unfair impression had been created as regards gas, as the £600 tender of the Electric Lighting Committee was conditional on profits being made. He did not see how the Committee could declare a profit for some years, until they had a depreciation fund. The engines they were using were calculated to last 21 years; but such progress was being made in electrical plant that they might be obsolete in ten years. The question was whether the Council were prepared to go in for an extra 1d. in the pound on the rates for lighting, which he felt would be the result of the suggested alteration. Mr. Baggott thought the matter required further consideration; and he moved that it be referred back to the Highways Committee. Alderman Pitt defended the action of the Electricity Committee, and said they could well afford to make such an offer to the Highway Committee as they had done. The amendment was lost, and the recommendation of the Committee approved.

DAMAGE TO GAS-MAINS BY DRAINAGE WORKS.

The Urban District Council of Newmarket have been carrying out a main drainage scheme, and in the course of the operations some damage was done to the mains and service-pipes of the Gas Company, who also lost a considerable quantity of gas. The Directors accordingly sent in a claim for compensation; putting the amount at £1410. The Council declined to admit liability to this extent, and arrangements were made for the matter to be settled by arbitration; Mr. Corbet Woodall being appointed by the Company, and Mr. H. E. Jones by the Council. However, as the result of friendly conferences between the Directors and deputations from the Council, the difficulty was overcome by the Directors accepting £766 10s. They had previously reduced their claim by one-third, in order to avoid litigation; but the Council would not give more than half. Thereupon the Company agreed to accept this amount, *plus* half the difference between it and the two-thirds, provided the offer were accepted at once. The terms of the settlement were announced at the last fortnightly meeting of the Council, when a letter was read from the Company's Solicitors stating that they would take steps to stay proceedings. On the same occasion, letters were submitted by the Clerk (Mr. S. J. Ennion) from the two Contractors for the work, to whom he had written intimating that the Council would call upon them to meet such portions of the amount paid to the Gas Company as were due to negligence on their part. In each case liability was repudiated.

GAS SUPPLY IN MADRID.

The somewhat peculiar position in which the Madrid Gas Company now find themselves was made clear to the proprietors in the report presented at the recent annual general meeting. The Company own altogether six works, the volume of gas sent out therefrom in the twelve months ending Dec. 31 last being 12,940,102 cubic metres, or close upon 460 million cubic feet, valued at 3,155,648 pesetas, or about £126,226. Compared with the previous year, there was a decrease in consumption of 402,604 cubic metres (14,212 cubic feet) and in receipts of 144,678 pesetas (£5786). On the other hand, the sale of coke, &c., realized 968,704 pesetas (£38,748) less than in 1901. The total receipts were 5,319,193 pesetas (£212,767) in 1902, and 6,433,576 pesetas (£257,343) in 1901. All the works were deficient in receipts—in some cases considerably so. The falling off is due to decreased manufacture of gas resulting from the sale of the Carthagene works, which in the previous year contributed about 300,000 pesetas (£12,000) to the total revenue. The diminished revenue is attributed to two causes—the drop in the receipts realized from the sale of coke and other residuals, and the reduction of 758,275 pesetas (£30,331) in dividends paid by the Madrid General Electric Lighting Company, in which the Gas Company are shareholders. The loss of revenue from the sale of coke is the result mainly of the short spell of cold weather during 1902, which brought down the sales to private consumers, and compelled the Company to sell at a cheaper rate to the coal merchants. With regard to the considerable deficit in the dividends distributed by the Electric Lighting Company, this was due to the necessary reduction in rates which the Company were compelled to make by competitors. Though some of the causes of reduced revenue may be accidental, the Directors consider that the Company can only expect slow and progressive improvement in case of the others; so that receipts of late years can only be hoped for at a more or less distant date. The fall in the rate of exchange will, it is hoped, have as a natural consequence a reduction in the cost of raw materials manufactured in Spain, and thus lighten the heavy expenses of the Company. Finally, there are hopes that the Electric Lighting Company will be able to come to an understanding with their competitors in the matter of tariffs. On Dec. 31 last, the works and dependencies of the Company figured in the credit account for 29,743,236 pesetas (£1,189,730). Stores in the warehouses in Madrid and at the provincial works represent a value of 2,981,496 pesetas (£119,260). The profit and loss account was debited with 269,804 pesetas (£10,792), which the Directors proposed to carry forward to the account for the current year.

THE WATER SUPPLY QUESTION AT SELBY.

Mr. Percy Griffith's Report.

In the "JOURNAL" for the 28th ult. (p. 248), it was stated that, owing to the critical position of the Selby water supply, Mr. Percy Griffith had been called in to report; and that the Council, at a special meeting, had resolved to apply for a loan of £1200, for the purpose of sinking a trial boring, as recommended by Mr. Griffith, at Brayton Barff. After pointing out in his report the danger in which the town is of a total failure of the supply, Mr. Griffith devotes attention to the question of whether the additional works necessary to augment the supply should be carried out at the present pumping-station or at some site beyond the area likely to be affected by the existing borehole. He prefers the latter course, for the following reasons: (*a*) No saving in expense would be secured by utilizing the site of the existing works, as in this case the additional storage required would have to be provided at a height sufficient to supply the town; and the extra cost of an elevated tank and tower, compared to that of a surface level reservoir on Brayton Barff, would more than compensate for the cost of the mains necessary to connect an alternative site with the town. In every other respect, the cost of the new works would be the same in either case. (*b*) A new boring sunk adjacent to the existing ones would not provide an additional supply of water, except in so far as the pumps were fixed at a lower level, and were of a larger capacity than the existing ones; and in this case pumping from either the new or the existing borehole would draw the water away from the other. Moreover, by pumping a larger quantity of water from this site than is at present being taken, all the private wells in the town would be affected to a serious extent, and the owners thereof would be compelled either to deepen their borings and lower their pumps or to take water from the town mains, which would increase the demand sufficiently to negative to a great extent the advantages of an increased supply. (*c*) In taking water from certain areas of the sandstone, there is a risk of drawing in impure water, such as has been met with at Scunthorpe, Goole, and elsewhere; and it is desirable to keep the new works as far to the west as possible, in order to avoid this risk. (*d*) Though the sandstone is covered at the present site by an impermeable bed of "drift," clays, &c., there is a risk of the sandstone water becoming polluted by means of the private wells in the town. These wells are not subject to any supervision by the Council, and might at any time become the vehicles of contamination from surface sources, which would endanger the whole supply of water in the sandstone immediately adjacent thereto. The site recommended would be free from such risks, as no private wells would be necessary in the neighbourhood of a water-works, itself providing an ample supply for all possible requirements; and moreover powers should be obtained to control the area of the exposed sandstone. Mr. Griffith is of opinion that any scheme that might be adopted should provide for the supply of 386,000 gallons of water a day; and in order to deal with any further increase in the demand, he suggests that the pumping machinery should be designed to supply this quantity in twelve hours, which would enable the Council to increase the amount of water by extending the hours of pumping. Before, however, proceeding to elaborate any scheme, it is essential to ascertain definitely the quantity, quality, rest level, and pumping level of the water obtainable at the site proposed. For this purpose, Mr. Griffith recommends that a trial boring be sunk; but as the prospects are distinctly favourable, and the extra cost would be small, he suggests that this boring should be of such dimensions and depth as to be available for permanent use should the results be satisfactory. The dimensions he proposes are 32 inches diameter to a depth of 100 feet, lined with 24-inch diameter cast-iron flush tubes, grouted with cement behind to render them absolutely water-tight; open boring, 24 inches in diameter to a depth of 200 feet from the surface; and 15 inches in diameter thence to a total depth of 400 feet. As, however, some time must elapse before the new scheme can be carried out, Mr. Griffith recommends the immediate provision of some temporary auxiliary to the existing borehole and pumping-plant. A new boring should, he says, be sunk in the existing works, 12 inches in diameter at the top, lined with steel tubes to a depth of 130 feet, and continued (unlined) to a total depth of 500 feet of a diameter of 10 inches. At the top of this boring a well or pit should be constructed about 12 feet deep, in which a Worthington or other suitable steam-pump should be fixed, having its suction carried down the boring for a depth of 30 feet. This pump would deliver the water either into the existing rising-main or direct to the tank by means of a new rising-main. His estimate of the cost of the proposed new boring and temporary pumping plant at the existing works is £980.

Price of Gas for Motive Power Purposes at Oldham.—In reply to a petition by the Hollinwood Improvement Society for a reduction in the price of gas used for motive power purposes, Mr. Arthur Andrew, the General Manager of the Oldham Corporation Gas Department, states that his Committee have taken the matter into consideration, with the result that they have lowered the price of gas for all purposes by 1d. per 1000 cubic feet. They cannot, however, see their way to make a further reduction in favour of persons using it for motive power.

LIVERPOOL CORPORATION WATER SUPPLY.

Annual Report of the Engineer.

The annual report of the Water Engineer to the Liverpool Corporation (Mr. J. Parry, M.Inst.C.E.) has lately been issued; and, as usual, it furnishes a great deal of information in regard to the important undertaking over which he exercises control. The sources of supply comprise the local wells and pumping-stations and the Rivington and Vrynwy works, the total expenditure on which, up to the 31st of December last, amounted to £5,198,611, of which £1,345,989 was for Rivington and £2,254,796 for Vrynwy. The total value of water delivered from the works during the past year, including compensation waters to rivers in Lancashire and Montgomeryshire, was: In gallons, 17,572,202,000; in cubic feet, 2,816,058,000; and in tons, 78,447,000. The increases over the previous year are shown by the following figures: Increase of population in and around Liverpool, 9233; increase in the total quantity of water distributed in the same area, 279,147,000 gallons; increase in the quantity sold by meter for trade purposes, 137,766,000 gallons; and increase in the quantity sold by meter outside the compulsory area, 18,473,000 gallons. The demand fluctuated from 18,650,000 to 34,188,000 gallons per day; the average daily consumption being 26,992,000 gallons. Water was used from the street hydrants for the extinction of 161 fires last year. The proportion of water obtained from the various sources is thus stated: From Vrynwy, 5,228,162,000 gallons; from Rivington, 3,863,491,000 gallons; from wells, 1,352,834,000 gallons; and salt water, 115,326,000 gallons—total, 10,559,813,000 gallons. The total number of tenants on the rent-roll of the water account at the end of the year was 184,467; and the gross revenue (including Chorley) amounted to £306,053.

Having furnished some particulars in regard to the supply of water in bulk to districts outside the compulsory area, Mr. Parry gives a short history of the salt water supply to the city, in view of the fact that the time is approaching when a new scheme will have to be submitted for dealing with the matter. He adds: "Whenever a deficiency of water has been experienced, and the question of an increased supply for the town has been under consideration, proposals have been made to supply salt water from the river for purposes not requiring fresh water; but the cost of any scheme involving the duplication of mains throughout the district has always been found to be altogether out of proportion to the relief that could be afforded or the benefits that would be derived." The total length of salt-water mains already laid is 4 miles 120 yards. During the year, additional distributing and fire mains were laid to the length of 11 miles 912 yards. The number of new fire hydrants fixed was 48, and of hydrants substituted for fire-plugs 216; making the total number of hydrants fixed during the year 264. A large amount of work was done last year by the Corporation plumbing and waste inspectors and by the testing and stamping department. The following fittings were tested; Draw-off cocks and stop-cocks, 44,678; ball cocks, 7566; cisterns with ball cocks, 7331; cisterns without ball cocks, 178—total, 59,753. The fees charged for testing and stamping amounted to £673 6s. 2d. The quality of the water supplied to the city during the year was well maintained; the bacteriological examinations by Professor Boyce, F.R.S., at the Thompson-Yates Laboratories of University College, showing that the average number of bacteria per cubic centimetre for the 365 daily samples was 30.

In the concluding portion of the report, Mr. Parry furnishes particulars in regard to the works. He refers to the acquisition by the Corporation, under their Act of last year, of power to purchase nearly the whole of the gathering-ground from which water is collected at Rivington. About 5000 acres are to be acquired under the compulsory powers thus obtained; the Corporation having already purchased by agreement some 3000 acres, in addition to 1000 acres secured for works purposes immediately after the passing of the Act of 1847 which authorized the construction of the works. When this measure was before the House of Lords, it was opposed by the Rivington landowners, and one result of this action was that clauses to prevent the fouling of the water, which had been inserted by Parliament in the Water-Works Clauses Act earlier in the year, were struck out of the Bill, and thus Liverpool was deprived of the protection which, under the general law, applied to all water-works undertakings. In the year 1871, the Corporation applied to Parliament for the restoration of these clauses, and succeeded in their object without encountering any opposition. Further powers to deal with pollutions in the event of neglect by the local Sanitary Authorities were obtained in 1887. The insufficiency of these powers has from time to time, and for many years, occupied the attention of the Water Committee; and having regard to the difficulties experienced, and the tendency of the increasing population of surrounding districts to press on to the watershed, the Committee were led to the conclusion, which has now received the approval of Parliament, that the purity of the water could only be effectually and permanently secured by the Corporation becoming owners of the whole of the land. Having been successful in obtaining powers for compulsory purchase, the Committee will soon be in a position to deal with the whole question, and to determine the policy to be adopted for the future utilization and management of the watershed. Mr. Parry remarks that any measures for preventing the pollution of the streams and reservoirs must necessarily have for their object a considerable reduction in the resident population; and he says this can be most advantageously brought about by limiting the uses of the land to such purposes as sheep farming, forestry, and sporting.

With reference to the Rivington aqueduct, Mr. Parry reports that the number of leakages caused by subsidence of the ground over coal workings was greater in 1902 than in any recent year. Altogether 165 leakages were reported and rectified. Of these, 154 were found to be from disturbed lead joints, which were repaired without stopping the flow to Liverpool. In 12 cases the leakages were so serious that the supply had to be shut off. Three cases of these were from fractured pipes, and new pipes had to be substituted; and in nine cases the

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 359.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
590,000	10	April 17	10⅞	Alliance & Dublin 10 p.c.	18½—19½	..	5 7 8
100,000	10	,,	7⅞	Do. 7 p.c.	13—14	..	5 7 2
200,000	5	May 14	6½	Bombay, Ltd.	5½—6	..	5 8 4
140,000	5	,,	6½	Do. New, £4 paid	4—4½	..	5 15 7
380,000	Stk.	Feb. 26	12	Brentford Consolidated	240—245	..	4 18 0
300,000	,,	,,	9	Do. New	178—183	..	4 18 4
50,000	,,	,,	5	Do. 5 p.c. Pref.	131—136	..	3 13 6
206,250	,,	June 11	4	Do. 4 p.c. Deb.	105—110	..	3 12 9
220,000	Stk.	Mar. 12	10¾	Brighton & Hove Orig.	212—217	..	4 19 1
246,320	,,	,,	7¾	Do. A. Ord. Stk.	151—156	..	4 19 4
460,000	20	Mar. 31	10	British	39½—40½	..	4 18 9
100,000	Stk.	Mar. 12	6	Bromley, 5 p.c. "A"	118—123	..	4 17 7
165,700	,,	,,	4½	Do. 3½ p.c. "B"	90—95	..	4 14 9
500,000	10	May 14	7	Buenos Ayres (New) Ltd.	10⅝—11¼	..	6 4 5
250,000	Stk.	June 26	4	Do. 4 p.c. Deb.	93—95	..	4 4 3
150,000	20	July 10	8½	Cagliari, Ltd.	22—24	..	6 17 6
100,000	10	June 11	10	Cape Town & Dis., Ltd.	14½—15½	..	6 9 0
50,000	50	May 2	6	Do. 6 p.c. 1st Mort.	52—54	..	5 11 1
1,375,000	Stk.	Feb. 26	5	Commercial 4 p.c. Stk.	103—106	..	4 14 4
503,750	,,	,,	4¾	Do. 3½ p.c. ,,	98—101	..	4 14 1
407,812	,,	June 11	3	Do. 3 p.c. Deb.,,	87—90	..	3 6 8
800,000	Stk.	June 11	7	Continental Union, Ltd.	120—125	..	5 12 0
200,000	,,	,,	7	Do. 7 p.c. Pref.	137—142	..	4 18 7
575,000	Stk.	Feb. 26	5½	Crystal Palace Ord. 5 p.c.	113—118	..	4 10 2
60,000	,,	,,	5	Do. 5 p.c. Pref.	120—125	..	4 0 0
111,533	,,	July 10	5	Do. 5 p.c. Deb. Stk.	135—138	..	3 12 6
486,090	10	July 29	10½	European, Ltd.	17½—18½*	..	5 13 6
354,060	10	,,	10½	Do. £7 10s. paid	12½—13⅜*	..	5 16 8
15,243,200	Stk.	Feb. 12	4 1/16	Gas-light and Coke — 4 p.c. Ord.	86—88	+1	5 0 0
2,600,000	,,	,,	3½	Gas-light and Coke — 3½ p.c. max.	85—87	..	4 0 6
3,799,735	,,	,,	4	Gas-light and Coke — 4 p.c. Con. Pref.	105—108	..	3 14 1
4,193,975	,,	June 11	3	Gas-light and Coke — 3 p.c. Con. Deb.	87—89	..	3 7 5
252,500	Stk.	Mar. 12	5	Hastings & St. L. 3½ p.c.	90—95	..	5 5 3
70,000	10	June 11	8	Hongkong & China, Ltd.	15—16	..	5 0 0
3,800,000	Stk.	May 14	10	Imperial Continental	200—205	..	4 17 7
473,600	Stk.	Feb. 12	3½	Do. 3½ p.c. Deb. Red.	100—103	..	3 8 0
165,242	Stk.	Mar. 12	6	Lea Bridge Ord. 5 p.c.	115—120	..	5 0 0
561,000	Stk.	Feb. 26	10	Liverpool United A	219—221	+1	4 10 6
718,100	,,	,,	7	Do. do. B	166—168	..	4 3 4
306,083	,,	June 26	4	Do. do. Deb. Stk.	110—112	..	3 11 5
75,000	5	June 11	5	Malta & Medn., Ltd.	4¼—4⅝	..	5 5 3
560,000	100	April 1	5	Met. of 5 p.c. Deb.	103—107	..	4 13 6
250,000	100	,,	4½	Melbourne 4½ p.c. Deb.	102—104	..	4 6 7
541,920	20	June 11	3½	Monte Video, Ltd.	9—10	..	7 0 0
1,515,892	Stk.	Feb 20	4½	Newc'tle & G'tesh'd Con.	104½—105½	+½	4 5 3
376,855	Stk.	July 3	3½	Do. 3½ p.c. Deb.	97—98	..	3 11 5
300,000	Stk.	May 14	8	Oriental, Ltd.	140—145	..	5 10 4
600,000	5	Mar. 31	7	Ottoman, Ltd.	5⅝—6⅝	−⅛	5 7 8
				* Ex div.			

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p.c.	GAS COMPANIES.			£ s. d.
205,005	Stk.	June 26	6⅛	Ply'mth & St'house 5 p.c.	123—128	..	4 15 8
851,070	10	April 30	7	River Plate Ord.	10¾—11¼	..	6 4 5
300,000	Stk.	June 26	4	Do. 4 p.c. Deb.	94—96	..	4 3 4
250,000	10	April 17	8	San Paulo, Ltd.	1 15/16—12½	..	6 8 0
135,000	Stk.	Mar. 12	10	Sheffield A	239—241	..	4 3 0
209,984	,,	,,	10	Do. B	237—240	..	4 3 4
523,498	,,	,,	10	Do. C	256—258	..	4 4 0
103,235	Stk.	Mar. 31	5	Shrewsbury Ord. 5 p.c.	111—114	..	4 7 9
6,150,000	Stk.	Feb. 12	5⅛	South Met., 4 p.c. Ord.	123—128	..	4 3 3
1,780,000	,,	July 10	3	Do. 3 p.c. Deb.	83—90	..	3 6 8
380,940	Stk.	May 14	5	Southampton Ord.	105—110	..	4 10 11
87,950	,,	July 10	4	Do. 4 p.c. Deb.	102—105	..	3 16 2
120,000	Stk.	Feb. 26	6	Tottenham and Edmonton — A. 5 p.c.	117—122	..	4 13 4
300,520	,,	,,	4½	Tottenham and Edmonton — B. 3½ p.c.	56—59	..	4 10 11
182,380	10	June 11	8	Tuscan, Ltd.	8—9	..	8 17 10
149,900	10	July 1	5	Do. 5 p.c. Deb. Red.	58—100	..	5 0 0
737,142	Stk.	Mar. 12	5	West Ham, 5 p.c. Ord.	95—100	..	5 0 0
				WATER COMPANIES			
780,776	Stk.	June 26	11⅛	Chelsea, Ord.	320—350	..	3 9 8
150,000	,,	,,	5	Do. 5 p.c. Pref.	147—150	..	3 6 8
160,000	,,	,,	4½	Do. 4½ p.c. Pref. '75	135—138	..	3 5 3
175,785	,,	Mar. 31	4½	Do. 4½ p.c. Deb.	137—142	..	3 3 5
1,720,560	Stk.	Mar. 31	8	East London, Ord.	237—242	−1	3 6 1
654,740	,,	June 11	4½	Do. 4½ p.c. Deb.	138—143	..	3 2 11
1,282,943	,,	,,	3	Do. 3 p.c. Deb.	93—96	..	3 2 6
150,000	50	June 11	10	Grand Junction — 10 p.c. max.	138—143	..	3 9 11
310,000	Stk.	Mar. 31	4	Grand Junction — 4 p.c. Deb.	123—128	..	3 2 6
708,000	Stk.	Feb. 26	10½	Kent	295—305	..	3 8 10
160,000	,,	,,	7	Do. New, 7 p.c. max.	200—210	..	3 6 8
1,043,800	100	June 26	11	Lambeth, 10 p.c. max.	310—320	..	3 8 9
406,200	100	,,	8½	Do. 7½ p.c. max.	222—230	..	3 13 11
350,000	Stk.	Mar. 31	4	Do. 4 p.c. Deb.	122—127	..	3 3 0
500,000	100	Feb. 12	12 5/10	New River, New Shares	430—440	..	2 18 2
1,000,000	Stk.	July 29	4	Do. 4 p.c. Deb.	121—124*	..	3 4 6
902,300	Stk.	June 11	7½	Southwark and Vauxhall — Ord.	265—275	..	2 15 2
126 500	100	,,	7½	Southwark and Vauxhall — 7½ p.c. max.	210—220	..	3 8 2
489,200	Stk.	,,	5	Southwark and Vauxhall — 5 p.c. Pref.	148—153	..	3 5 4
1,019,585	,,	Mar. 31	4	Southwark and Vauxhall — 4 p.c. A Deb.	122—127	..	3 3 0
1,155,066	Stk.	June 11	10	West Middlesex	295—305	..	3 5 7
200,000	,,	,,	4½	Do. 4½ p.c. Deb.	136—141	..	3 3 10
200,000	,,	Mar. 12	3	Do. 3 p.c. Deb.	94—96	..	3 2 6
				* Ex div.			

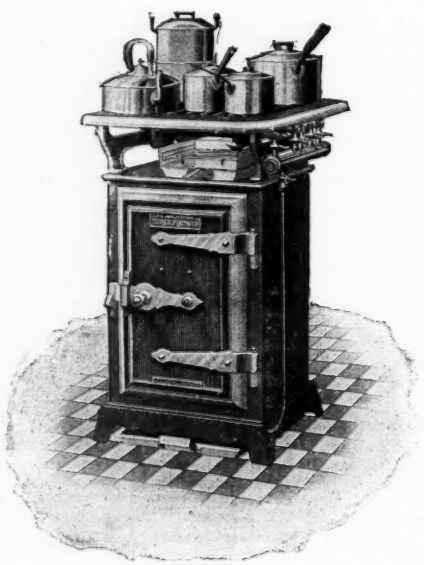
joints were badly drawn. The construction of the South Lancashire Tramways through Hindley and Ashton was an event of considerable importance in connection with the maintenance of the aqueduct. For a length of about 2¾ miles these tramways have been formed on public highways under which the Rivington pipes are laid, and throughout this length the rails are either directly over, or immediately adjacent to, the line of aqueduct. Mr. Parry points out that the difficulties and inconveniences arising from the construction and working of the tramways are felt in a variety of ways. For example, when a leakage occurs under the tram-lines, the water is prevented from rising to the surface by the impervious paving between and adjacent to the rails; thus causing the water to travel to places, often at a long distance, where there is the least resistance to the upward flow. This accordingly increases the difficulty of discovering the exact spot where a leakage is taking place; and the resultant delay through having to make additional excavations is in some cases very serious. When a leakage has been traced to its source, the difficulty of repairing the defect is increased by the existence of the rails and other tramway constructions, as also by the temporary arrangements that have to be made for the running of the tram-cars. Although the Corporation are well protected under the Tramways Clauses Act against any additional cost that may be incurred by reason of the tramways, the interruption that may be caused to the delivery of water through the aqueduct to Liverpool, for which the Act could not make any provision, is more important.

The next matter dealt with is the supply of water by the Corporation to Wallasey. Preliminary inquiries as to the possibility of obtaining a supply of water from Liverpool were received from Wallasey as far back as December, 1895; but in November, 1898, a formal and definite application came from the District Council, asking for the terms upon which a supply would be given. Negotiations following thereon extended over nearly two years. The final agreement between the Corporation and the Council is dated Sept. 19, 1900. By it the Corporation undertook to lay, at the expense of the Council, a main of 21 inches internal diameter from the Vyrnwy aqueduct, in Delamere, to Wallasey, and to supply a minimum quantity of half-a-million gallons of water per day within three months of the completion of the pipe-line. The Council may, upon three months' notice, require the Corporation to supply any additional quantity of water up to the full capacity of the 21-inch pipe (estimated at about 2 million gallons per day), provided that the quantity so demanded does not exceed a million gallons per day until after Sept. 19, 1905. In November, 1900, the Council applied to the Local Government Board for sanction to borrow a sum not exceeding £146,000 to enable the Corporation to lay down the necessary pipes. An inquiry by an Inspector of the Board was held at Wallasey on May 21, 1901; and the sanction of the Board was obtained on the 18th of October following. Tenders for the pipes and pipe laying were invited early in November; and the tenders of Messrs. D. Y. Stewart and Co., of Glasgow, to supply the pipes, and of Messrs. Holme and King, Limited, of Liverpool, to lay them, were accepted on Dec. 4, 1901. The contracts were signed on Jan. 14, 1902. By the specifications, the Contractors were required to deliver, lay, and complete the pipes at the rate of a mile per week, beginning on Feb. 1, 1902, and to complete the whole of the undertaking within nine months from this date. At the outset the pipe laying was delayed by frost, and the work was not commenced until the 2nd of April. By the end of the year, the laying of 22¾ miles had been accomplished. As the undertaking was not completed during the past year, Mr. Parry reserves a detailed description for his next report.

An important feature of the past year's work was the commencement of a second line of pipes from Vyrnwy. When these works were approaching completion in December, 1887, the Committee carefully considered their future position, more particularly with respect to applications then being made by local authorities outside the compulsory area for supplies of water in bulk. After the introduction of the supply from Vyrnwy, the increase in the consumption was not greater than had been anticipated; but towards the end of 1896, the prospect was such as to lead the Committee to pass a resolution requesting the Engineer to submit a memorandum showing how far the existing sources and means of water supply were adequate to meet the requirements at that time, and also in the future, so far as the latter could reasonably be foreseen; and, in the event of either being insufficient, to suggest how an increased supply could be had to the best advantage and at the least cost. A report upon this resolution was presented in February, 1897, and was under consideration until July, 1898, when a further resolution was passed, requesting him to submit a detailed report upon various matters connected with the state and sufficiency of the supply; and in January, 1899, he was instructed to prepare plans and estimates for the construction of a second pipe-line from Vyrnwy to Prescot. As soon as a favourable opportunity offered for inviting manufacturers to send in tenders, it was decided to proceed with one section of the work (that between Norton and Prescot), at an estimated expenditure of £116,000. The tender of the Widnes Foundry Company to supply pipes for this section (9¼ miles in length) was accepted on the 5th of March; and the total length of pipes delivered to the end of the year was rather less than four miles. On the 16th of April, the tender of Messrs. Kirk, Knight, and Co. was accepted for laying these pipes, and between the 11th of July and the end of the year 1½ miles had been completed. On the 9th of December, the Committee decided to invite tenders for the cast-iron pipes required to complete three more sections of the line—viz., from Hirnant to Oswestry (13¼ miles), from the Malpas reservoir to the Cotebrook reservoir (11½ miles), and from the latter to the Norton reservoir (11 miles). All these pipes are 42 inches in internal diameter; and particulars of the contracts concerning them are promised by Mr. Parry in his next annual report.

Messrs. Henry Greene and Sons, Limited, of London, have during the past few days been entrusted with orders for sulphate of ammonia plant for the South Shields, Romsey, and Ulverston Gas-Works.

FOR ALL TIMES AND SEASONS



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Cooker

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NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

This week has seen the severance of two Gas Managers in Scotland from their posts. But in how different methods! In the one case, Mr. A. Smith, of Aberdeen, goes out from among his brethren full of years and honours; and in the other case, Mr. Forbes Waddell, of Broughty Ferry, has had his engagement with the Corporation violently terminated by them.

Mr. Smith's is a sad case. Mental decay has been creeping over him for a long time; and he has now sunk into that condition in which he is not able even to direct his own resignation. The members of his family, satisfied from medical advice that there is no hope of recovery, have placed his resignation in the hands of the Town Council. A life of great usefulness has been brought, not to an end, but into a condition of eclipse, by the loss of that faculty which makes man the lord of creation. His has been a career of great distinction. An engineer by profession, he was familiar, in his youth, with gas-works construction; but when he was appointed Manager of the Aberdeen Gaslight Company's undertaking, thirty-six years ago, he had to learn the process of gas manufacture. It is but the other day I was informed that when Mr. Smith was appointed, one of the works staff intimated his resignation on the ground that he was not going to teach his new master. Apparently the new master did not require much teaching—at least, for many years he was as expert a gas maker as was to be found in all the country. To the latest everything which was new was of interest to him; and if it appeared to be satisfactory, it was at once adopted. Hence he came to have as well-equipped a gas-works as was to be met with anywhere. He was even one of the very few who manufacture cyanogen. Since the Corporation took over the gas undertaking, the annual manufacture of gas has risen from 146 to 630 million cubic feet, which gives some idea of the scope Mr. Smith had for his energies. Latterly he was Engineer to the Electricity Department of the Corporation as well as to the Gas Department. Now, when he rests from his labours, the sympathies of all who enjoyed his acquaintanceship, or who worked along with him, will go out to him in no measured degree. The letter of resignation was submitted at a meeting of the Town Council yesterday; and it was remitted to the Gas Commlttee to consider and report as to the retiring allowance to be granted to Mr. Smith. Mr. Kemp, the Convener of the Commissioners, expressed the regret of the Committee at parting with so old and tried a servant.

Mr. Forbes Waddell's is a sadder case than that of Mr. Smith, because all must bow to Nature; but Mr. Waddell's removal has not been natural. In the ordinary course, he should have had many years in which to serve the comm unity of Broughty Ferry. The Town Council have decreed it otherwise, and have brought his engagement to an abrupt end. They have never asked him for an explanation of how matters came to be as they are, but, upon receipt of a report upon the condition of the gas-works, they have proceeded immediately to the pronouncing of sentence and to summary execution. The methods are not, happily, those which are usually followed in this country by corporations in dealing with officials. A sense of fair-play would have dictated that Mr. Waddell should at least have received a copy of the report upon which he has been condemned, and have been allowed an opportunity of making remarks upon it, either in writing or verbally. Even if he had tabled a report by an engineer appointed by himself, which, as Manager of the works, it was within his right to do, the Council ought to have given it their best consideration. But such a step was made next to impossible by the pulling down of the retort-settings, which had the effect of destroying any evidence they might have afforded as to the state of the partitions and flues. Mr. Waddell has certainly been treated in a manner so cavalierly that I question if there is a gas manager anywhere who would desire to have the same treatment meted out to him, in circumstances at all similar. I write of what has appeared in public; for I have no knowledge otherwise of anything that may have occurred.

It will not be out of place to mention that my "Notes" have borne testimony frequently to the fact that the Corporation have pursued a vacillating policy for some years upon the administration of the gas undertaking. I need not recount the various movements; but I refer to the circumstance in order to bring out that, in the remarks of the councillors who supported the motion for dismissal, it was admitted that they strongly condemned what is known as "the forward policy"—which was Mr. Waddell's policy—at the gas-works. This, then, is the first point to be noted, that the present majority of the Council are opposed to the pushing of the gas business; and if they are consistent, there should now be a withdrawal from some of the positions which have been occupied by the gas undertaking, notably that which has reference to the sale and hire of gas-stoves. Mr. Westwood has been perhaps the most uncompromising opponent of Mr. Waddell's policy. Mr. Westwood sells coke; and one of the things which he wanted to find out, quite naturally, but was unable to get the information he desired, was the price at which coke was sold. Quite recently he took the unusual step of writing to the Secretary for Scotland in opposition to a proposal for the procuring of a loan for gas-works purposes. He was not then in the ascendant in the Council; but immediately on the loan being authorized, the Town Chamberlain reported a deficit upon last year's working of £2200, which had the effect of turning certain of the councillors to Mr. Westwood's way of thinking. He became a hero—a position he holds himself in yet—for he told the Council on Tuesday evening that "he had prophesied that the Council would come to the stage they had now reached." The date of this prophecy was not given, which is a pity, as it would have fixed the time when Mr. Westwood's mind was set upon a change of Manager for the gas-works. This is the second point to be noted, that Mr. Waddell's dismissal was being sought before there was any notion of a deficit, or any knowledge of damaged retort-

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settings. Thus we see that the genesis of this movement was not what has been, in the end, made the occasion of dismissal. But the third point to be noted is that, in the motion for dismissal, no mention of any reason for taking the drastic step is given, but that such reason has to be spelt out of the remarks made in support of the motion. There, again, it is observable that it was not the condition of the retort-settings which led to the motion being brought forward, because, according to Bailie Lindsay, this might have been forgiven; but it was the want of straightforwardness which was the serious offence for which Mr. Waddell was being tried. Apparently Mr. Herring's report would not have condemned Mr. Waddell if Mr. Waddell had not previously assured the Council that the retorts were in good order, and if he had not over-estimated the stocks of coal and coke. These were Bailie Lindsay's views; but others on his side brought in arguments, such as the excess of the expenditure upon the retort-house over the estimate, and the want of periodic testings for strength of the ammoniacal liquor. Explanations, of course, might have been given of these and other items; but they were not asked. It almost seems as if, hands having been counted, it was found that Mr. Waddell could be dismissed—and the Council took the earliest and readiest means of dismissing him. There was force in the argument that Mr. Waddell was not likely to be energetic in carrying out the suggestions of Mr. Herring as to the future. How could he be? If Mr. Herring had been called in to advise Mr. Waddell, he might have been; but, though we do not know the terms of Mr. Herring's employment, we know the effect of his inspection of the works, and we know that, at the meeting at which Mr. Herring's report was submitted, notice of the motion for dismissal was given, and so Mr. Waddell was, of necessity, thrown at once into a defiant attitude. He would not have been a human being if he had not. I stop here my remarks as to the matter, not going into Mr. Herring's work, which Mr. Waddell was not allowed to criticize, nor into Mr. Waddell's criticism of it in the public Press, because comparisons with Mr. Herring at home and the results at Broughty Ferry are personal matters between Mr. Herring and Mr. Waddell, and are not relevant in a question between Mr. Waddell and his Corporation.

It will be observed that, having dismissed Mr. Waddell, the Town Council made no arrangements for filling up the vacancy. This was probably on account of the lateness of the hour at which the meeting terminated. On the day after the meeting, Mr. Moffat, an Assistant of Mr. Herring's, arrived in Broughty Ferry, at the request of the Committee, and Mr. Waddell was relieved of his charge. This is a temporary arrangement, to be in force until a new manager is appointed.

On Tuesday evening, the Town Council, in Committee, considered the accounts for the past year, and the estimates for the current year. They are to be before the Council again next week. It is estimated that the output of gas will be some 55,845,000 cubic feet, which is about 10 million cubic feet less than was estimated a year ago, showing that the new controllers of the gas undertaking are preparing for a policy of retrenchment. The estimated income is £11,206, and the estimated expenditure, including £2091 of deficit, £11,196; leaving an apparent surplus of £10. It is proposed, in order to accomplish these results, to raise the price of gas from 3s. 4d. to 3s. 9d. per 1000 cubic feet. In the estimate, it is assumed that nearly £200 will be saved in wages of stokers in the gas-works, as the result of the working of coal and coke handling plant.

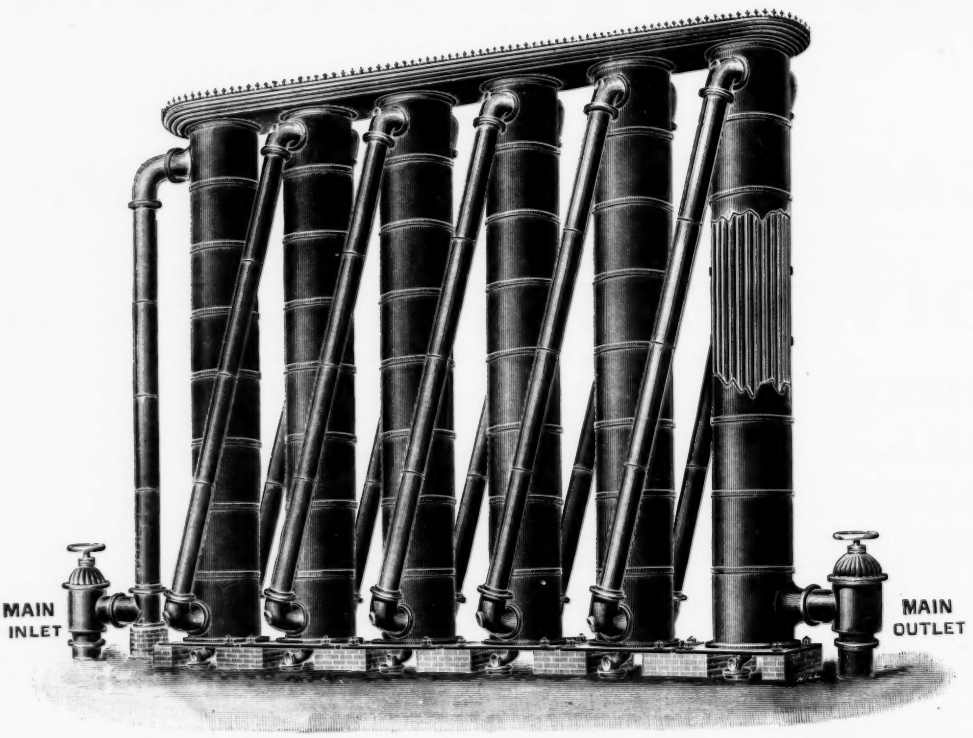
The Coatbridge Gas Company last week reduced the price of gas from 2s. 4d. to 2s. 2d. per 1000 cubic feet. This is the second year in succession in which they have taken 2d. off the price of gas. During the past half year, they had an increased manufacture of gas by about 3 million cubic feet; and they added 390 to the number of their consumers. The gross revenue amounted to £11,551, which enabled them to declare the customary dividends of 10 per cent. upon the old stock, and 7 per cent. upon the new. This is a highly successful result in the case of a Company which is so heavily weighted with capital. As to who sells the cheapest gas in Scotland, Hamilton is first at 2s. 1d per 1000 cubic feet. For second place there is a sort of tie between Coatbridge and Alloa, both of which now sell at 2s. 2d., with this difference, that in Alloa the charge for gas for motive power is 2s. per 1000 cubic feet. Mr. Wilson's returns are unique. He carbonized during the half year 8528 tons of coal, from which he had a yield of 7948 cubic feet per ton, and a resulting product of 9·80 gallons of green tar, and of 32 lbs. of sulphate of ammonia. This coal cost him £3131; and he had returns, exclusive of gas, of £555 from tar, £1274 from sulphate of ammonia, and £1688 from coke and char. With £46 from cash sales, the total return from secondary products was £3563, so that he received for residual products £432 more than he paid for coal. The cost per 1000 cubic feet of gas manufactured was 11·08d., and the return 12·61d.; so that he had actually a surplus of 1·53d. per 1000 cubic feet upon coal. He paid £559 for benzol for enriching, which was at the rate of 1·98d. per 1000 cubic feet of gas manufactured. The total cost of the manufacture of gas was 1s. 4·49d. per 1000 cubic feet, which, with the credit of 1·53d. from residuals, reduced his manufacturing charge to 1s. 2·96d. per 1000 cubic feet of gas made. The average cost of coal per ton was 7s. 4·11d., and of benzol 1s. 3·72d. With 700,000 cubic feet of gas in stock at the beginning of the half year, the total quantity manufactured was 68,492,000 cubic feet. The quantity unaccounted for was 6,495,752 cubic feet, which is equal to 9·58 per cent. It may be said that in Coatbridge gas is in reality the secondary product.

The Gas-Works Committee of the Arbroath Town Council on Wednesday considered the accounts for the past year and estimates for the current year. They recommended that the price of gas should be reduced from 4s. 4½d. to 3s. 6½d. per 1000 cubic feet—a reduction of 10d. —to date from April. The Committee also agreed to recommend that the Manager (Mr. S. C. Young) should receive an honorarium of £50 for the additional work he undertook during the year.

Work has been begun at North Berwick with the construction of the railway siding which is to connect the railway system with the new gas-works the Corporation are about to erect. Messrs. Henry Balfour and Co., Limited, of Leven (Fife), have secured the contract for the erection of a gasholder, with cast-iron tank, at the new works. The

CONDENSERS.

WATER COOLING.



ATMOSPHERIC.

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holder is to be of 120,000 cubic feet capacity. The new holder, if all goes well, will be used during the coming season; and the anticipation is that the new works will be opened next summer. The works are being built to plans by Mr. J. M'Gilchrist, of Dumbarton; and their erection is being superintended by his son—Mr. John M'Gilchrist.

The Anstruther Gas Company last year earned a profit of £478. A dividend of 5 per cent. has been paid, and £150 allowed for depreciation. The quantity of gas sold was 10⅜ million cubic feet, which, at 3s. 9d. per 1000 cubic feet, yielded a revenue of £1928. The East Wemyss and Buckhaven Gaslight Company have paid a dividend of 5 per cent., and reduced the price of gas by 5d. per 1000 cubic feet. This is the second year in succession in which a similar reduction has taken place.

The accounts of the Glasgow Corporation Electricity Department for the past year have been issued. They show a revenue of £127,004—an increase of £24,000 upon the previous year. Generating and distribution charges amounted to £50,939, interest to £33,275, allowance for sinking fund to £11,771, and the cost of changing voltage to £6936. There is a surplus on the working of £24,483; but the Electricity Committee have written off £37,000 for depreciation, which converts the surplus into a deficit of £13,217.

At a meeting of the Edinburgh and District Water Trust last week, Mr. Wood, the Convener of the Finance Committee, submitted the accounts for the past year. These showed a revenue of £111,664—an increase of £209 upon the estimate; and an expenditure of £118,612—a decrease of £843 upon the estimate. After allowing for arrears of rates to be recovered, the deficit on the year's working was £6294. Mr. Wood said that, as the Trustees were fully aware, the expenditure had materially increased during the past years in consequence of the carrying out of the works authorized in connection with the Talla scheme. From 1895, when the Act passed, to Whitsunday last, there had been expended on the Talla scheme a capital sum of £751,255, and a further capital expenditure in connection with the Moorfoot works and distribution pipes of £180,000; so that the sum charged for interest on capital expenditure, which in 1894-5 amounted to £21,402, had this year gone up to £41,427—an increase of £20,025. This large expenditure had been met, up to the present time, by the revenue from year to year and the surplus revenues of previous years; but during the past three years there had been an excess of expenditure over revenue, which had now reduced the surplus revenue from £34,463, at which it stood at May 15, 1900, to £16,159 at May 15, 1903. This sum would, however, be more than enough to meet any possible deficit for the present year. The accounts were approved.

A meeting of the Water Committee of the Arbroath Corporation was held on Thursday, at which it was resolved to abandon consideration of the Tarry Burn scheme of extension—a local scheme, which, it is assumed, would be opposed by manufacturers who use the water; and also to drop the proposal to acquire a supply from the Crombie reservoir of the Dundee Corporation, unless it were possible to purchase the reservoir outright. The supply from the Noran stream was then considered; and the gaugings which have been taken upon the stream during the summer having proved satisfactory, it was resolved to proceed with negotiations with respect to it, and to endeavour to have the scheme ready for submission to next session of Parliament.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Aug.* 8.

Sulphate of Ammonia.

The market remains very quiet, and prices are barely maintained; the closing quotations being £12 3s. 9d. per ton f.o.b. Hull, and £12 5s. to £12 7s. 6d. per ton f.o.b. Liverpool and Leith. Notwithstanding the dulness prevailing throughout July, shipments for the month have only been 500 tons below those for July last year, so that stocks have nowhere accumulated to an appreciable extent. Makers who have had their production to dispose of would seem to have been rather too anxious to avail of the relatively high level of prices current, and to have themselves contributed to the decline in values, though the policy of speculators in offering ahead at a discount has been mainly responsible for it. In the forward position, there has been less doing, a point in prices having been reached at which buyers would operate extensively, but at which sellers will not go on. At the close, £12 7s. 6d. per ton is generally quoted for delivery up to the end of the year, and £12 10s. per ton for January-March or January-April delivery.

Nitrate of Soda.

This is firm, and spot prices are 9s. 9d. and 10s. per cwt. for ordinary and refined qualities respectively.

LONDON, *Aug.* 7.

Tar Products.

There is really very little business to advise, the markets being generally quiet. The prices of pitch are steady; but there is certainly very little demand for either prompt or forward delivery, which, however, is not unusual at this time of year. In addition to this, so much tar has recently been let on the sliding-scale, that the distillers are not now so anxious to sell forward as has been the case in previous years. Benzol is still in fairly good demand for gas enriching; but for export, there does not seem to be any inquiry. As regards home consumption, a small business is reported in 50-90 per cent. at 7d. Toluol and solvent are both very depressed; and it is difficult to fix the values, there being absolutely no demand for either of these articles. Crude carbolic acid continues in good request at 1s. 6d. for 60's; but makers as a rule ask 1s. 7d. for forward delivery. In creosote, a very large business has recently been done in the North of England at fairly good prices; and the demand seems to have improved during the last week. Tar prices are still very inflated; but it seems as if the

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18 DEVONSHIRE STREET, BISHOPSGATE, LONDON, E.C.

ruinous competition which recently prevailed may not continue very much longer, as the present outlook for products does not warrant absurdly high prices for tar.

The average values during the week were: Pitch, London, 55s. to 55s. 6d.; east coast, 53s. to 53s. 6d.; west coast, 51s. to 51s. 6d. Benzol, 90 per cent., 8¼d. to 9d.; 50-90 per cent., 7d. Toluol, 6½d. to 7d. Crude naphtha, 2½d. to 3d.; solvent naphtha, 7d. to 7½d.; heavy naphtha, 9d. Creosote, London, 1⅛d. to 1⅜d.; North, 1¼d. Heavy oils, 2½d. Carbolic acid, 60 per cent., 1s. 6d. Refined naphthalene, £5 to £8 10s.; salts, 22s. 6d. to 25s. Anthracene, "A" quality, 1¾d. to 1⅞d.; "B" quality, 1d. nominal.

Sulphate of Ammonia.

The situation remains unchanged; but the markets are generally quiet. The Gaslight and Coke Company still ask £12 7s. 6d., but have not done business at this price. It is reported that business has taken place for August-March at £12 5s. on Beckton terms. In Hull, there are sellers at £12 5s.; but buyers will not pay more than £12 2s. 6d. for prompt or forward delivery. In Leith, makers as a rule quote £12 7s. 6d.; but there does not seem much business doing at this price, although sales are reported for forward delivery at a little under. In Liverpool, some small sales have taken place at £12 6s. 3d. The market closes quiet; and there is really very little doing.

COAL TRADE REPORTS.

Lancashire Coal Trade.

A slow dragging sort of business continues to be the general report throughout the coal trade; and notwithstanding holiday and other stoppages reduce the output to little more than half the average production, supplies are ample with stocks accumulating. The house-fire coal demand is of the smallest possible dimensions; but as the season is now well advanced, and another month will probably see a decided change in the market position; it is very exceptional where coalowners at all attempt to force sales at lower prices. The average quoted rates remain about 13s. 6d. to 14s. 6d. per ton for the best Wigan Arley, 11s. to 11s. 6d. to 12s. for seconds Arley and Pemberton four feet, and about 9s. 6d. to 10s. and 10s. 6d. for common house-fire varieties. There is perhaps rather more shipping inquiry for house-fire qualities for coast-wise cargoes; but apart from these both the inland and the shipping demand for common round coals suitable for steam and forge perhaps remain indifferent, and low quotations continue to be made for prompt clearance sales. In the present state of the market, buyers and consumers are content to purchase simply from hand to mouth at the low rates just now current; and there is very little enquiry with regard to forward contracts. On the other hand, coalowners, although in many cases they are prepared to cut prices for clearance, are disinclined to commit themselves far ahead, except at better prices than are just at present ruling on prompt sales. Common steam and forge coals for inland sale range from 7s. 9d. and 8s. 3d. to 8s. 6d. and 8s. 9d. per ton at the pit, with steam coal delivered at the ports on the Mersey obtainable on special sales at about 8s. 9d. to 9s., with average quotations about 9s. 6d. to 9s. 9d. There is nothing new to report with regard to gas-making coals, the position remaining practically as reported last week. The better qualities of engine fuel move off fairly well; and with no great surplus of supplies on the market, prices are being maintained at late rates, averaging 5s. 3d. to 5s. 9d. per ton at the pit for good medium sorts, and from 6s. 3d. up to 6s. 9d. for the very best qualities. The commoner sorts of slack, which have to meet a good deal of competition with surplus output from other districts and are plentiful on the market, have in many cases to be cut low to effect sales, and can be bought from 3s. 9d. to 4s. 3d. per ton at the pit, with ordinary quotations about 4s. 6d. to 4s. 9d.

Northern Coal Trade.

There is a good demand for coals; the holidays having lessened stocks and also allowed the collier steamers at the ports to increase. In the steam coal trade, the demand is full, and shipments are generally heavy. The best collieries seem to have full orders booked; so that the prospect is that for some weeks there will be considerable activity at the collieries, though not perhaps so marked at the second-class collieries. Best Northumbrian steam coals are steady at 11s. per ton f.o.b.; for second-class steams, the quotation varies from about 9s. to 9s. 3d.; while for steam smalls, the price is from 5s. 3d. to 5s. 6d. The household coal trade is very dull, with a limited demand. In the gas coal trade, the export demand is very full for the season, and the prices are well maintained. For occasional cargoes, the quotation, according to quality, is from 8s. 6d. to 9s. 3d. per ton f.o b.; and one or two small contracts have been fixed at prices between these figures. Gas coke seems scarce, though the production is beginning appreciably to increase. Good sorts are quoted as high as 14s. 9d. per ton free on Tyneside.

Scotch Coal Trade.

A firmer tone is reported, which seems to correspond with the maintained demand for shipping. The home trade is also somewhat stronger, and will likely keep so now, as there will be a disposition to lay in stocks for the winter. The prices quoted are: Main 8s. to 8s. 3d. per ton f.o.b. Glasgow, ell 8s. 6d. to 10s., and splint 9s. 3d. to 9s. 6d. The shipments for the week amounted to 210,583 tons—an increase of 103,392 tons upon the previous week, which was the holiday week, and of 510 tons upon the corresponding week of last year. For the year to date, the total shipments have been 6,180,565 tons—an increase of 206,351 tons upon the same period of last year.

CARBURETTED WATER-GAS APPARATUS

Merrifield—Westcott—Pearson Patents.

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CARBURETTED WATER-GAS ENGINEERS.

The above Company have erected since 1893, or are now erecting, their Universal Type of Carburetted Water-Gas Plant at the following Gas-Works:—

	Cub. Ft. Daily.		Cub. Ft. Daily.		Cub. Ft. Daily.
BLACKBURN	1,250,000	ST. CATHERINES (Remodelled)	250,000	ACCRINGTON	500,000
WINDSOR ST. WORKS, BIRMINGHAM	2,000,000	KINGSTON, PA.	125,000	TONBRIDGE	300,000
SALTLEY WORKS, BIRMINGHAM	2,000,000	PETERBOROUGH, ONT.	250,000	STRETFORD	500,000
COLCHESTER	300,000	WILKESBARRE, PA.	750,000	OLDBURY	300,000
BIRKENHEAD	2,250,000	ST. CATHERINES (Second Contract)	250,000	TODMORDEN	500,000
SWINDON (New Swindon Gas Co.)	120,000	BUFFALO, N.Y.	2,000,000	SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000	WINNIPEG, MAN.	500,000	YORK (Second Contract)	750,000
WINDSOR ST., BIRMINGHAM (Second Contract)	2,000,000	COLCHESTER (Second Contract)	300,000	ROCHESTER (Second Contract)	500,000
HALIFAX	1,000,000	YORK	750,000	NEWPORT (MON.)	250,000
TORONTO	250,000	ROCHESTER	500,000	TOKIO, JAPAN	1,000,000
OTTAWA	250,000	KINGSTON, ONT.	300,000	PERNAMBUCO (Brazil)	125,000
LINDSAY (Remodelled)	25,000	CRYSTAL PALACE DISTRICT	2,000,000	MALTON	150,000
MONTREAL	500,000	DULUTH, MINN.	300,000	DULUTH, MINN. (Second Contract)	300,000
TORONTO (Second Contract Remodelled)	2,000,000	CATERHAM	150,000	BROCKVILLE (ONT.)	250,000
BELLEVILLE	250,000	LEICESTER	2,000,000	SMETHWICK	500,000
OTTAWA (Second Contract)	250,000	ENSCHEDE (HOLLAND)	150,000	GRAVESEND	300,000
BRANTFORD (Remodelled)	200,000	BUENOS AYRES (RIVER PLATE CO.)	700,000	NEWPORT MON. (Second Contract)	250,000
		BURNLEY	1,500,000	TORONTO (Third Contract)	750,000
		KINGSTON-ON-THAMES	1,750,000	TORONTO (Fourth Contract)	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

LEEDS, 1,800,000 C. Ft. LEICESTER (2nd Cont.), 1,000,000 C. Ft. NEWCASTLE-ON-TYNE, 1,800,000 C. Ft.
MONTREAL, ONT. (Second Contract) . . . . . 1,800,000 Cub. Ft.

Hurtwood Water Company, Limited.—Under this title, a Company has been formed, with a capital of £10,000, in £5 shares, to supply water to the South Ward of the parish of Shere, Surrey; to adopt an agreement with the Rural District Council of Guildford; and to carry on the business of a water company generally. There will be no initial public issue.

Sales of Stocks and Shares.—At a sale recently conducted by Messrs. Lees Firth and Sons at Oldham, two parcels of 30 perpetual annuities of £1 each, created under the Oldham Corporation Gas and Water Act, 1853, fetched £930 each, one more fetched £935, and a parcel of 22 similar annuities £700. At the Mart, Tokenhouse Yard, a short time ago, Messrs. Fox and Bousfield sold by auction, by order of the Directors, £4346 of 5 per cent. preference stock of the Horley District Gas Company (being an issue of new capital under the Company's Act of 1901), at from £93 10s. to £95 per £100 of stock. Six £10 shares in the St. Neots (Hunts.) Gas Company were sold on Thursday by auction at £23 5s. each, *ex* a dividend of £1 per share for the year paid on the following day. This is the highest price the shares have ever realized.

Small Water-Mains.—The "Local Government Journal," referring to the fact that, in order to keep down the cost of providing rural districts with water, it is a common practice of local authorities to sanction the laying of water-mains of very small diameter, thinks it should be known that the Local Government Board disapprove of these small pipes, the practical effect being that if the local body in any particular case intend to spread the cost over a term of years by means of a loan, they will find it impossible to obtain the requisite consent. The Board base their objection upon the argument that while a 1½-inch or 2-inch pipe may suffice at first to supply a rural village or collection of properties with water, it will most probably corrode in time—perhaps very soon—if the water is of a kind favourable to incrustation, and that a main of such a small bore originally will thus fail to convey a sufficient quantity of water.

Ilkeston Gas Supply.—In the last issue of the "JOURNAL," we gave the principal results of the working of the gas undertaking of the Ilkeston Corporation (which is under the management of Mr. F. C. Humphrys), in the past financial year. The quantity of gas made was 94,453,000 cubic feet, against 83,456,000 cubic feet in the preceding year—an increase of about 11 million cubic feet. An analysis of the accounts of the undertaking shows the cost per 1000 cubic feet to be 1s. 7·05d.; and the amount received for residuals, 9·52d.—leaving the net cost of gas in the holder at 9·53d. Distribution, rates and taxes, management, &c., come to 6·18d.; making the total cost of gas to the consumer 1s. 3·71d. Interest and standing charges absorb 9d., or, with the contribution to the rates, just over 1s. The present charge for gas is from 2s. 5d. to 2s. 8d. per 1000 feet. The total number of consumers is 3218, of whom 2048 are on the prepayment system. The capital account has been reduced from £876 to £802 per million cubic feet made.

Free Gas-Cookers for Birkenhead.—Alderman Bloor, in submitting the minutes of the Gas and Water Committee at the last meeting of the Birkenhead Town Council, said the automatic meter supply of gas cost the consumers 3s. 4d. per 1000 cubic feet, against 2s. 6d. for the ordinary supply. The Committee therefore found there was a margin available for reduction; and they had decided to remit the 6d. a quarter rent charged for small gas-cookers, and also to fix them free. They had now 5500 cookers in use, and 4000 consumers who used gas for lighting only. The Committee hoped that most of the latter would also take cookers; and this, at the usual 6s. a year profit, would mean £1000 or more extra profit to the undertaking. Alderman Shaw thought the proposal would interfere with private traders. He asked whether the 6s. per stove profit allowed for depreciation. Alderman Bloor said it did, and was a clear profit. He admitted that the gas-stoves account showed a loss; but the stoves earned a large profit in gas. The minutes were adopted.

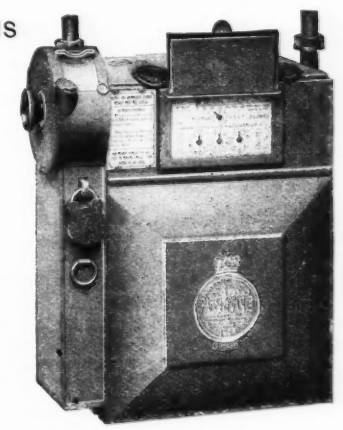
Erdington and the Birmingham Corporation Bill.—At the meeting of the Erdington District Council last Wednesday, the Chairman (Mr. J. Dawson) presented a report upon the result of the opposition of the district to the proposal of the Birmingham Corporation to erect gas-works at Birches Green. The decision of the Committee of the House of Commons that the preamble of the Bill, so far as it related to this matter, was not proved, was, he said, cause for profound satisfaction and congratulation to every ratepayer in the district. The opposition was undertaken in no fractious or unfriendly spirit, but solely to preserve for their own district those suburban and semi-rural characteristics for which they had laboured hard and spent large sums of money during the past nine years. The success involved no serious loss or detriment to Birmingham; for it was shown in the course of the inquiry that there were other sites more eligible than the one in dispute. They hoped the controversy was now ended. The report was adopted; and a vote of thanks was accorded to Sir P. A. Muntz for his assistance to the Council by giving evidence before the Committee.

Paris Water Supply.—In his last letter, the Paris correspondent of the "Builder" states that the Paris Municipal Council have under consideration two schemes for increasing the supply of drinking water for the city—one submitted by the Prefecture of the Seine, the other put forward by one of the members of the Council. The former provides for bringing up the daily supply per inhabitant to 50 gallons, exclusive of river water for general purposes. Estimating the population of Paris in 1930 to be 4 millions, the daily supply required to be provided within the next few years will have to be 200 million gallons. Nearly half of this quantity, it is estimated, may be procured from the subterranean waters of the Val d'Orléans, in the basin of the Loire; and a fifth aqueduct, upwards of 60 miles long, will have to be constructed. A preliminary portion of the remaining quantity will be obtained from new supplies brought through the existing aqueduct of the Avre. The estimated cost of the work is 130,000,000 frs. The second scheme is much more economical; but it would afford a very inadequate supply. It is proposed by this scheme to take off the springs at Fontaine-sous-Jouy and Cailly, near Evreux, and lead the water to Paris through the existing aqueducts of the Avre.

PARKINSON'S

SLOT INSTALLATIONS

FOR QUOTATIONS



WRITE—

PARKINSON AND W. & B. COWAN LTD.,
(PARKINSON BRANCH)
LONDON AND BIRMINGHAM.

Metropolitan Water Board.—At the meeting of the Board on Friday, only a few items of formal business were transacted in public; among them being the payment of £5000 for Solicitor's fees. The rest of the sitting was devoted to the consideration *in camerâ* of the claims put in by the Water Companies and the answers to be made to them by the Board. The first of these—the answer to the claim of the East London Company—has to be deposited with the Secretary of the Court of Arbitration on or before the 17th inst.

Darlington Corporation Gas Supply.—At the meeting of the Darlington Town Council on Thursday, Alderman Barron presented the report of the Gas Committee for the year ending the 31st of March. He said they had made about £3000 more profit than in the preceding year, which, with the £5000 already handed to the Finance Committee, was available for the relief of the rates. A small balance they proposed to add to the reserve fund, making it £1300. The relief was equal to a rate of 11·64d. in the pound, against 10·04d. (£7467) and 10·76d. (£7858) before. There was a steady improvement, an increasing demand, and a better "day load," as the Electrical Department would call it.

Extensions at the Southport Gas-Works.—It has been decided by the Gas Committee of the Southport Corporation to expend £5341 on new works during the period ending March 31 next. The actual outlay will be as follows: Carburetted water-gas plant, £4790; new steam-boilers, £740; iron machinery room, £289; economizer, £211; concrete brickwork and labour, £1000—total, £7030. But from this will be deducted, for the removal and re-erection of carburetted water-gas plant, £800; machinery-room, £289; concrete brickwork, £600—£1689. The probable annual charge for interest and sinking fund will be 3½ per cent., £185 10s.; and sinking fund at 20 years, £198 15s. 4d.—together, £384 5s. 4d.

Gas v. Electricity at Market Drayton.—A short time ago, the Market Drayton gas inspectors, in presenting their annual report to the Parish Council, expressed dissatisfaction with the lighting of the town, and suggested that the electric light should be tried. In consequence of this suggestion, a meeting of parishioners was called, and the lighting powers transferred to the Parish Council, after which a Committee was formed to take the question into consideration. At a recent special meeting of the Council, the Committee recommended them to accept a tender from the Gas Company to light the town for the ensuing year for £130, finding all labour, and supplying mantles and other appliances—the lamps to be lighted and extinguished at times stipulated. One of the gas inspectors strongly objected to the tender being accepted, especially as the Electric Light Company had not, he understood, been asked to give an estimate. Several amendments were proposed; but eventually the recommendation of the Committee was approved.

Leeds Water-Works Arbitration.—A few weeks ago, Lieut.-Col. W. H. Wellsted, M.Inst.C.E., of Hull, was engaged for several days as Umpire in connection with arbitration proceedings with reference to the compulsory sale to the Leeds Corporation of 395 acres of freehold land belonging to Lord Masham. The land is situated on his Lordship's Swinton Estate, near Masham, and is required for the construction of the Colsterdale and Leighton reservoirs and the easements for the catchwater as well as two aqueducts extending a distance of more than seven miles. The amount claimed was £196,000, which was also for consequential damage caused during the construction of the works, and afterwards to Swinton Castle, as well as for interference with the sporting rights, shooting, and fishing on the remainder of the estate, and the timber. The witnesses for the Corporation valued the property at £27,000. The Umpire has awarded his Lordship £46,489. Mr. T. Fenwick, M.Inst.C.E., was Arbitrator for the claimant; Mr. C. Gott, M.Inst.C.E., for the Corporation.

New Water-Works for Margate.—Last Thursday, the new water-works which have been carried out for Margate, to the plans of Mr. Albert Latham, M.Inst.C.E., the former Borough Engineer, were formally opened by the Mayor (Mr. J. J. Hermitage, J.P.). Particulars of the scheme have been given in the "JOURNAL." The site of the pumping-station is a mile south of Wingham, 14 miles from Margate, and the store of water is so plentiful that, instead of driving adits for 3000 yards, only 1200 yards have been constructed, and a supply of 3 million gallons per day is now available. The quantity at present required is 1½ million gallons daily; and the supply can be further extended at any time, as the Corporation possess powers to drive adits for three miles. As the Royal Assent was not given to the Bill sanctioning the works until Aug. 8 last year, the work has been expeditiously carried out by Mr. Latham. At the inaugural ceremony, a short statement was made by the Chairman of the Water Committee of the Corporation (Mr. Macfarlane) who has been the chief means of bringing the scheme to completion. After the Mayor had performed the ceremony of turning on the water, he was presented by the Engineer with a large silver goblet as a *souvenir* of the occasion.

Gas Lighting for Withernsea.—At the last meeting of the Withernsea Urban District Council, an agreement entered into between the Council and the Holderness Gas Company, Limited, was read and sealed. It was laid down therein that the applicants for the supply of Withernsea with gas shall, within six months from the date of the agreement, lay a 6-inch main throughout the main street, from north to south of the district. The proposed gas-works are to be erected on a freehold site acquired by the applicants, who are to provide lamp-posts, and supply gas to the Council at a price not exceeding 3s. 2d. per 1000 cubic feet, and allow all consumers who pay their accounts within 28 days of demand a discount of 5 per cent. If the applicants pay a dividend on their capital exceeding 6 per cent., the price of gas for the public supply is to be reduced 1d. per 1000 cubic feet for each 1 per cent. excess of dividend. The price to be charged to private consumers is not to be more than 4s. 3d., and is to be reduced at least 1d. per 1000, as in the former case, if a dividend of more than 6 per cent. is paid. The applicants are to keep all the mains in repair to the satisfaction of the Council's Surveyor; and at the expiration of 21 years the Council may, after twelve months' notice, purchase the undertaking as a going concern.

RICHMOND'S

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EVERYWHERE.

Batley Corporation Gas and Water Supply.—The abstract of accounts of the Batley Corporation for the year ended March 31 last shows that the gas profits amounted to £10,897. Out of this sum, £4735 went into the sinking fund and for payment of interest, £2000 was applied in aid of the rates, and £2162 was placed to the contingency fund. The lighting of the borough cost £1980, or £170 more than in the previous year, owing mainly to the introduction of incandescent burners. In the Water Department, there was a gain of £3002 in income over expenditure. The supply of water by meter produced £6304, as compared with £5726 in the previous year.

Failure of the Electric Light at Cowes.—Paragraphs which reach us from time to time afford proof that the electric light is just as liable as ever to fail at the most inopportune moment. On the occasion of the visit of the King to the Naval College buildings at Osborne on Tuesday, His Majesty and the Prince of Wales honoured the members of the Royal Yacht Squadron with their presence at dinner. Just as they had finished, the electric light failed, and the whole company were left with only such light as was shed by the moon through the glass structure in which they were assembled. His Majesty was heartily amused at the predicament in which they all were. Numerous candles were procured; and by this light His Majesty, the Prince, and the gentlemen present, passed out into the gardens, where a musical entertainment was in progress.

Great Demand for Free Cookers in Manchester.—Since it was made known that, as from the 24th ult., the charge for the hire of gas-cookers would be abolished by the Manchester Corporation Gas Department, the number of applications made in respect thereto has been 3107; and the number of cookers actually fixed, over 2000. Applications still come in daily in large numbers; and the new departure has resulted in a crop of requests for the repayment of the amounts paid for past hireage, and the repurchase from consumers of such cookers as have been in use for longer or shorter periods, and were originally sold by the Corporation. In addition to supplying and fixing the cookers, the officials of the department give clear instructions as to their use; but, by the neglect of these instructions, there will, it is expected, be not a little grumbling at the end of the quarter when the gas bills are presented.

Municipal Scandal in Naples.—According to a Reuter telegram which appeared in the London papers on Friday, the trial of Signor Casale, an ex-Deputy, Signor Summonte, a former Mayor of Naples, and a number of other persons, for malpractices and frauds in connection with the administration of the municipal affairs of the city, was brought to a close on the previous day. Signori Casale and Summonte were sentenced to 37 months' imprisonment, and to pay a fine of 1000 lire. Signor Desiena, ex-Deputy Mayor, and Signor Krafft, formerly Manager to the Gas Company (the Campagnie Napolitaine), were sentenced to 30 months' imprisonment, and to pay a fine of 1000 lire. Signor Damelio was sent to prison for 33 months, and fined 400 lire. Signor Pérouse, a Director of the Gas Company, was sentenced to 15 months' imprisonment, and to pay a fine of 500 lire. Sentences varying from two to six months' imprisonment were passed on the other accused, except 16, including Signor Villiers, Director of Tramways, who were acquitted. Some of the parties have, it is reported, also been condemned to banishment from the city for certain terms. The proceedings caused considerable excitement.

Reductions in Price.—The Lancaster Town Council have resolved that, as from the September readings of the meters, the price of gas shall be reduced from 2s. 7d. to 2s. 6d. per 1000 cubic feet, with the usual discount of 3d. In their half-yearly report, the Directors of the Cambridge Gas Company announce that, owing to the favourable coal contracts entered into, they have been able to reduce the price of gas 2d. to 3s. per 1000 cubic feet from the end of the past quarter. The Directors of the Cardiff Gas Company, having secured some little reduction in the price of next winter's supply of coal, have announced that, as from Sept. 29, the charge for gas throughout the whole of their district, including Penarth and Llandaff, will be lowered 2d. per 1000 cubic feet, thus bringing the rate down to the old level. As from the 1st ult., the Grantham Gas Company have made a reduction in the general price of gas from 3s. 3d. to 3s. 2d. per 1000 cubic feet, and in the price of that used for power purposes from 3s. 3d. to 2s. 9d. per 1000 feet. As mentioned in the notice of the Derby Company's meeting which appears elsewhere, reductions of 2d. and 3d. per 1000 cubic feet will be made in the price of gas as from the September readings of the meters. The Bath Gas Company announce a reduction of 1d. per 1000 cubic feet to ordinary consumers and for the public lighting. The price is now 2s. 3d. The Dewsbury Town Council have reduced the price of gas from 3s. 4d. to 3s. 2d. per 1000 cubic feet.

The Profit-Sharing Scheme of the Chester Gas Company.—At the recent meeting of this Company, the Profit-Sharing Committee presented their second annual report; being the first with the experience of twelve months' working after the declaration of a bonus. They stated that the amount of bonus declared for the past year was £170 15s. 3d., which, with £3 14s. 7d. interest on sums left with the Company, made a total of £174 9s. 10d. placed to the credit of profit-sharers' accounts. The amount withdrawn during the year had been £32 18s. 7d.; and four profit-sharing employees had purchased, by sums to their credit and additional savings, £50 of the Company's ordinary stock. The pass-books of those who had not withdrawn any portion showed a substantial credit amount with bonus for two years and interest added; and this the Committee thought should encourage every profit-sharer to allow his bonus to accumulate, so that it might ultimately reach a total which would be of effective assistance in the future. The Committee were satisfied that greater interest had been taken on the part of each profit-sharing employee in the concern, to secure efficiency and economy on the works; and they appealed for still greater efforts in this direction, particularly for closer attention to details, to the small things which were often overlooked, but which accounted very largely for the success or otherwise of any such scheme. The report was adopted.

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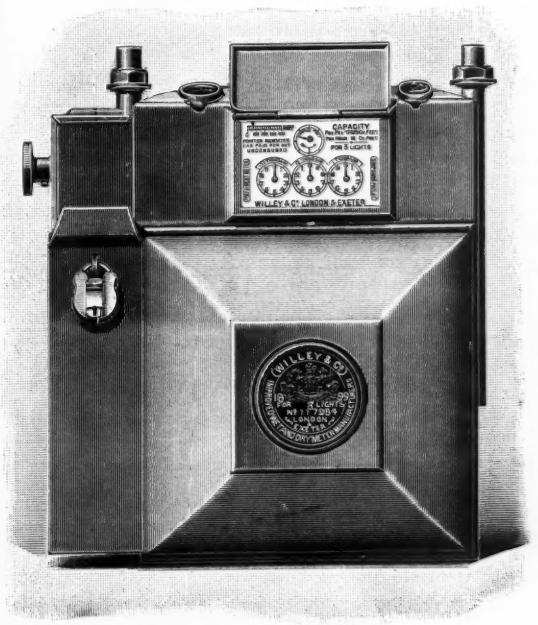
2nd.—The Slot is closed when the maximum number of Coins have been inserted.

3rd.—Our Price-Changing System is the Simplest, Quickest, and most Accurate yet devised.



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WILLEY & CO., LONDON AND EXETER.

The Maryborough Gas Company have instructed Messrs. R. Dempster and Sons, Limited, of Elland, to proceed with the erection of three arches of Waddell's patent regenerators, and also to supply and erect an exhauster, &c.

The Dewsbury Town Council have allowed the Gas Engineer and Manager (Mr. C. A. Craven, Assoc.M.Inst.C.E.) £25 for extra duties performed in connection with the alterations to the sulphate of ammonia plant at the gas-works.

Sir John T. Brunner, M.P., Chairman of Brunner, Mond, and Co., chemical manufacturers, of Clydach, has intimated that his co-partner and himself will present to Northwich, and the county of Chester, a secondary school equipped for the teaching of 200 scholars.

Colonel Slack, an Inspector of the Local Government Board, held an inquiry last week at New Mills, into the District Council's application to borrow £3000 for gas-works extensions. Since the Council acquired the works ten years ago, the number of consumers has nearly trebled.

The "Newcastle Chronicle" states that to inaugurate the opening of their new electric station, the Oldham Electricity Committee partook of what was described in their minutes as "a light dinner;" the items including 37 bottles of champagne, 30 bottles of wine and whisky, and 475 cigars, the total cost of which was £57 9s. 9d.

In their annual report, the Directors of the Leeds Fire-Clay Company state that, after charging £10,425 for interest on debentures, and £2151 for premium on redemption of debentures, the divisible profit for the year ending June 30, including £14,410 brought forward, amounts to £65,811. An interim dividend at the rate of 5 per cent. per annum has been paid on the ordinary shares, and a final distribution at the rate of 3 per cent. per annum is recommended; making 4 per cent. for the year, and leaving £13,811 to be carried forward.

The Neath Town Council had before them at their last meeting a recommendation by the Gas Committee to increase the salary of the Engineer and Manager (Mr. R. A. Browning) by £70 per annum. The Chairman of the Committee (Mr. Hopkin Jones), addressing the Council in support of the recommendation, said Mr. Browning was appointed in 1880, and the condition of the undertaking, regarded from a commercial standpoint, was eloquent testimony to the care which characterized the management. The increase was granted.

At the meeting of the Gas Committee of the Macclesfield Corporation on Wednesday, the salary of the Gas Engineer (Mr. Ernest L. Newbigging) was raised £50 per annum.

The "Australasian Trade Notes" in last Thursday's "Financial News" contained the following paragraph: "The discovery of petroleum in the neighbourhood of the Coorong is attracting the attention of capitalists. For years it has been known that a material from which oil could be extracted existed in the locality; but only spasmodic efforts were made to test the field. Lately, however, more determined measures have been taken; and there is now every probability of energetic operations being conducted on an important scale to develop the industry. Several companies have been formed to exploit the fields. Prospecting is also being actively engaged in; and up to date 184 licences have been taken out, of which 172 have been issued since April. The oil-bearing area covers 598 square miles, comprising a strip of country about eight miles inland from the Coorong, and stretching from Lake Albert Station to Didicoolum. Already the revenue of the Mining Department has benefited to the amount of nearly £600 from licence fees."

Mr. Registrar Hood has been engaged at the Bankruptcy Court inquiring into the failure of the Desrumaux Automatic Water Softener and Purifier, Limited. The Company was incorporated in 1899, with a nominal capital of £75,000, to work the patent of M. Henri Desrumaux, for softening and purifying water. The winding-up order was made on the 31st of March. The accounts showed unsecured liabilities £9036, against assets £2831 absorbed by the claims of debenture holders. The deficiency, as regards contributories, is returned at £53,400. Mr. J. L. Harrison, a partner in the firm of Messrs. Harrison and Townsend, stock and share dealers, of Bradford, said that a Mr. Elmore approached him with a view to his finding subscribers for the shares, and he arranged to send out the prospectus, but had nothing to do with the drafting of it. It was understood that, in return for the services rendered, the firm should divide with Mr. Elmore the profit on the promotion; and they accordingly received 18,666 shares. Witness was certainly not aware that any material facts were omitted from the prospectus. Mr. R. J. Hannam, one of the original Directors, said he had advanced the Company between £7000 and £8000, and had also financed the patent to the extent of about £10,000, against which all he held was a debenture for £4500.

NOTICES TO CORRESPONDENTS, ADVERTISERS, AND SUBSCRIBERS.

No notice can be taken of anonymous communications. Whatever is intended for insertion in the "JOURNAL" must be authenticated by the name and address of the writer; not necessarily for publication, but as a proof of good faith.

COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office NOT LATER than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received by the FIRST POST on SATURDAY.

Wanted, For Sale, and Tender Advertisements, Six Lines and under 3s.; each additional Line, 6d.

TERMS OF SUBSCRIPTION to the "JOURNAL."

United Kingdom: One Year, 21s.; Half-Year, 10s. 6d.; Quarter, 6s. 6d.
Payable in Advance. If credit is taken, the charge is 25s. a year.

Abroad (in the Postal Union): £1 5s. 6d., payable in Advance.

All Communications, Remittances, &c., to be addressed to
WALTER KING, 11, BOLT COURT, FLEET STREET, LONDON, E.C.
Telegrams: "GASKING, LONDON." Telephone: P.O. 1571a Central.

WANTED, FOR SALE, CONTRACT, &c., ADVERTISEMENTS IN THIS WEEK'S "JOURNAL."

Situations Vacant.

ASSISTANT-MANAGER. Colne Gas Department. Aug. 18.
ASSISTANT-MANAGER. Ilford Gas Company. Aug. 15.
FITTER AND SMITH. No. 4072.
FITTER (Engine and General). No. 4074.
JUNIOR CLERK. No. 4075.
MAINLAYERS (Two). Elstree Gas-Works.
RETORT SETTER. Rotherham Gas Department. Aug. 12.
SERVICE LAYER AND GAS FITTER. East Cowes (Isle of Wight) Gas-Works.
SLOT METER COLLECTOR. Ilford Gas Company.
TINSMITH. Rotherham Gas Department.
WATER-WORKS FITTER. Phillips, 38, Parliament St. S.W.

Situations Wanted.

LECTURER ON GAS COOKING, &c. Madame Alting-Mees, London.
MANAGER, Medium-Sized Gas-Works. No. 4076.

Plant for Sale.

EXHAUSTER AND ENGINE, BOILERS, STEAM-HAMMER, MORTAR MILL, &c. No. 4073.
MOUTHPIECES, HYDRAULIC MAIN, PIPES, AND VALVES, &c., Robins, Sutton, Surrey.

Meetings of Companies.

BARNET GAS COMPANY. Aug. 28.
COLNEY HATCH GAS COMPANY. Aug. 27.
MITCHAM AND WIMBLEDON GAS COMPANY. Aug 25.
NORTH MIDDLESEX GAS COMPANY. Aug. 26.
RIDDINGS GAS COMPANY. Aug. 28.
TOTTENHAM AND EDMONTON GAS COMPANY. Aug. 22.

Stocks and Shares.

NEWCASTLE AND GATESHEAD GAS COMPANY. Aug. 25.
PORTSMOUTH WATER COMPANY. Sept. 30.

TENDERS FOR

Coal and Cannel.

KESWICK GAS COMPANY. Tenders by Aug. 25.
STRATFORD-ON-AVON GAS DEPARTMENT.

Gasholder Tank.

DEVONPORT GAS DEPARTMENT. Tenders by Aug. 29.

Oxide of Iron.

DEVONPORT GAS DEPARTMENT. Tenders by Aug. 29.
EDINBURGH AND LEITH GAS COMMISSIONERS. Tenders by Aug. 15.
SALFORD GAS DEPARTMENT. Tenders by Aug. 20.

Pipes and Pipe Laying.

DEVONPORT GAS DEPARTMENT. Tenders by Aug. 29.
LEIGH CORPORATION. Tenders by Aug. 22.

Tar and Ammoniacal Liquor.

BIRMINGHAM GAS DEPARTMENT. Tenders by Sept 30.

Valves, &c.

DEVONPORT GAS DEPARTMENT. Tenders by Aug. 29.

Water-Gas Plant.

ABERGAVENNY CORPORATION. Tenders by Aug. 26.

OXIDE OF IRON.

O'NEILL'S OXIDE has a larger annual sale than all other Oxides combined.

SPENT OXIDE purchased in any district.

GAS PURIFICATION & CHEMICAL CO., LD.,

JOHN WM. O'NEILL, Managing Director,

PALMERSTON HOUSE, LONDON, E.C.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.
Resists 4500° Fahr. Best for GAS-WORKS.
ANDREW STEPHENSON, 182, Palmerston House, Old Broad Street, London, E.C. "Volcanism, London."

BROTHERTON & CO., LIMITED.
Offices: Commercial Buildings, LEEDS.
Correspondence invited.

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM, and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Addresses:
"Braddock, Oldham." "Metrique, London."

DUTCH OXIDE OF IRON.

THE First Dutch Bog Ore Co., Ltd.
(Eerste Hollandsche Yzererts Maaty), ROTTERDAM.
General Manager for England and Wales—
CHARLES E. FRY, LEAMINGTON; and at Tower Chambers, Brown Street, MANCHESTER.
London Managers—
E. PADFIELD & CO., 96-98, Leadenhall Street, LONDON, E.C.
General Manager (for Scotland)—
J. B. MACDERMOTT, 11, Bothwell St., GLASGOW.

COAL GAS TAR wanted.
Gas Managers in Gloucester, Somerset, Worcester, Devon, Wilts, Hereford, Monmouth, and Glamorgan PLEASE NOTE. BEST PRICE offered either on Fixed or Sliding-Scale Basis.
State Quantity to offer for Prompt and Forward Delivery.
The SHARPNESS CHEMICAL COMPANY, Tar Distillers, Sharpness Docks, GLOS.

OXIDE OF IRON.
(NATURAL.)

BALE & CHURCH will be pleased to send Samples and Quotations, and make Offers for SPENT OXIDE.

BALE'S FIRE CEMENT, PAINT, AND GAS COAL.
5, CROOKED LANE, LONDON, E.C.

GAS TAR wanted.
BROTHERTON AND CO., LTD., Tar Distillers.
Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SULPHURIC ACID.

SPECIALLY prepared for the Manufacture of SULPHATE OF AMMONIA.

SPENCER, CHAPMAN, AND MESSEL, LIMITED, 36, Mark Lane, LONDON, E.C. Works: SILVERTOWN.

Telegrams: "HYDROCHLORIC, LONDON."
Telephone: 341 AVENUE.

SULPHATE OF AMMONIA SATURATORS and LEAD WORK for Sulphate of Ammonia Plants.

For REPAIRS or ALTERATIONS, ring up "0848 BOLTON," or Telegraph "SATURATORS, BOLTON."

Largest Practice and most Up-to-Date Works in Britain.

JOSEPH TAYLOR AND CO., CENTRAL PLUMBING WORKS, BOLTON.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.

Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of Special SULPHURIC ACID, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol, which has now been used for upwards of 50 Years. References given to Gas Companies.

PENNY-IN-THE-SLOT WORK.

H. GREENE & SONS, Ltd., are prepared to give QUOTATIONS to Gas Companies or Corporations for FITTING UP COMPLETE and CARRYING OUT the WORK in its entirety, either in Iron or Compo.

SURREY ENGINEERING WORKS, BLACKFRIARS ROAD, LONDON, S.E.
Telephone: 1693 HOP. Telegrams: "LUMINOSITY."

SULPHURIC ACID for Sale.

BROTHERTON AND CO., LTD., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS AND TRADE MARKS PUBLICATIONS. "MERCHANDISE MARKS ACT, and Decisions thereunder," 1s.; "TRADE SECRETS v. PATENTS," 6d.; "DOCTRINE of EQUIVALENTS, Mechanical and Chemical," 6d.; "SUBJECT-MATTER of PATENTS," 6d.

MEWBURN, ELLIS, & PRYOR, Chartered Patent Agents, 70 and 72, Chancery Lane, London, W.C. Telegrams: "Patent London." Telephone: No. 243 Holborn.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., LTD., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.

Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.

READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

BY the adoption of Cripps's Bye-Pass VALVES inside your Purifiers, you can relieve the Back-Pressure in the Lower Tiers when the Purifying Material gets hard. They are extremely useful and economical.

Sole Makers: C. & W. WALKER, LIMITED, Midland Iron-Works, Donnington, near Newport, SHROPSHIRE.

MADAME ALTING-MEES, Diplomée Paris, Londres, Bruxelles, "LECTURER ON GAS COOKING," is now booking dates for Lectures on the Continent and at home. Would accept a suitable permanent post as Demonstrator.

Write for terms for Lectures and Price of Pamphlet, "La Cuisine au Gaz," to Madame ALTING-MEES, 102, Sinclair Road, Kensington, LONDON, W.

APPLICANTS for the position of GENERAL FOREMAN, No. 4068, are THANKED, and hereby informed that the Vacancy has been FILLED.

ADVERTISER seeks re-engagement as MANAGER of medium sized Gas-Works—from 10 Millions upwards. Thoroughly practical in all departments of Gas-Works, as well as Outside Fitting, Mains, and Stoves. Age 36. Good Testimonials and References.

Address No. 4076, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ENGINE AND GENERAL FITTER.

WANTED for a Gas and Water Works in Worcestershire, an Experienced and Competent FITTER. Must be capable of keeping all Machinery, including Steam and Gas Engines, Pumps, Exhausters, Coal and Coke Handling Plant, &c., in good running order. Abstainer Preferred. Age not to exceed 35. A permanency to a good man. Wages, 50s. per week.

Apply, by letter, in the first place, giving Experience and References, to No. 4074, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, immediately, Two good MAINLAYERS. Several Months' Employment.

Apply to the MANAGER, Gas-Works, Elstree, HERTS.

SLOT-METER Collector wanted. Previous Experience necessary.

Apply, by letter only, stating Age, Experience, Salary required, and when able to take up duties, to H. W. ASHMOLE, Secretary, Ilford Gas Company, Cranbrook Road, ILFORD.

FITTER and Smith Wanted, used to the Routine of a Gas-Works. A qualified Mechanic preferred.

Apply, by letter, stating all Particulars as to previous and present Employments, Age, and Wages required, to No. 4072, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a smart reliable Man as SERVICE LAYER and GAS-FITTER, used to Iron and Compo., and able to read Meters. One who can do Light Smith Work preferred.

Applications, with References, stating Wages required, to be sent to Mr. ROBERT FISH, Lessee, Gas-Works, East Cowes, ISLE OF WIGHT.

COUNTY BOROUGH OF ROTHERHAM.
(GAS DEPARTMENT.)

WANTED, a First-Class Tinsmith, capable of Making and Repairing Street-Lamps.

Apply, stating Wages required, to the undersigned.
FRANK A. WINSTANLEY,
Engineer and Manager.

COUNTY BOROUGH OF ROTHERHAM.
(GAS DEPARTMENT.)

WANTED, a First-Class Retort Setter. Preference given to one understanding Regenerator Furnaces and Inclines.

Apply, on or before Aug. 12, to the undersigned.
FRANK A. WINSTANLEY,
Engineer and Manager.

WANTED, a Junior Clerk for Gas Office, to assist in and Collect Accounts, act as Meter Inspector (Prepayment and Ordinary), attend to Fittings, Stocks, and generally to assist Manager. One used to Gas-Works routine, and willing to make himself useful.

Apply, by letter, stating Wages required, Age, Experience, and with References, to No. 4075, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WATER-WORKS FITTER.

THE Hemel Hempsted Corporation require a FITTER for their Water-Works. To be experienced in Laying Mains and Services, and with some experience of Pumping Plant.

A permanent position to a good man. Wages 32s. per week.

Applications, stating Age and Experience, to be sent in to Mr. A. F. PHILLIPS, M.Inst.C.E., 38, Parliament Street, WESTMINSTER.

ILFORD GAS COMPANY.

AN Assistant-Manager wanted for the above Works, making 200 million cubic feet of Gas per Annum.

Candidates must possess a thorough knowledge of Gas Manufacture and Practical Experience in the preparation of Drawings, Chemical Analysis, Carbonization with Regenerative Settings, and the Manufacture of Sulphate of Ammonia.

Applications, enclosing *copies* of Testimonials, and stating Age and Salary required, endorsed "Assistant-Manager," to be sent in by the 15th inst. addressed to the SECRETARY, Ilford Gas Company, ILFORD.

Aug. 4, 1903.

BOROUGH OF COLNE.
(GAS DEPARTMENT.)

ASSISTANT-MANAGER.

THE Gas Committee invite Applications for the position of ASSISTANT GAS MANAGER. Salary, £100 per annum.

Any person wishing to apply may obtain a List of the Duties from the undersigned.

Applications, stating Age and Experience, and enclosing *copies* of not more than Three recent Testimonials (which will not be returned), must be addressed to the Chairman of the Gas Committee, endorsed "Assistant," and delivered at the Gas-Works not later than Noon on Tuesday, Aug. 18, 1903.

FRED THORPE,
Engineer and Manager.

Gas-Works, Colne (Lancs.),
July 30, 1903.

WANTED, Gas Carbon, in Four Ton Lots or more, f.o.r. Must be Clean and Hard Lumps.

Address No. 4044, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

CAST-IRON TANKS.

SEVENTY Tons of New Plates in Stock, ¾ inch or ⅞ inch Metal. £5 per Ton, or will quote for finished Tanks.

STEAVENSON AND CO., 21, Lime Street, LONDON, E.C.

FOR SALE—One Gas Exhauster and ENGINE combined, by Tangye, for 10,000 to 15,000 cubic feet per hour. Good, Cheap.

Three EGG-END BOILERS 30 ft. by 5 ft., suitable for Tar or Liquor Tanks. Good.

One 5 feet MORTAR MILL, by Smedley. Good.

One 3 cwt. STEAM HAMMER.

Apply No. 4073, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

TO BE SOLD—Purifiers, Two or Four 10 feet square by 4 ft. 6 in. deep, planed Joints Connections, and Overhead Girders.

Write J. WRIGHT, 181, QUEEN VICTORIA STREET, E.C.

FOR SALE—20-inch Valves, Tees, BENDS, CROSSES, &c., Second-Hand, Cheap. In Good Condition. Makers, Newton Chambers.

Apply to DUXBURY & CO., MANCHESTER.

TAR Contracts Wanted on the Sliding-Scale or at Fixed Prices

Managers and Secretaries desirous of selling to best advantage please communicate with DENT AND CO., Ouse Chemical Works, SELBY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS including Retorts and Fittings, Condensers, Exhausters Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.

J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

FOR SALE—59 18 in. by 15 in. Ω-RETORT MOUTHPIECES, fitted with Tangyes' patent Lids; 6-inch Outlets.

30 18-inch Round RETORT MOUTHPIECES, fitted with Tangyes' patent Lids; 6-inch Outlets.

Three lengths Cast-Iron HYDRAULIC MAIN, with 4-inch Outlet and Valves.

18 6-inch ASCENSION, ARCH, and DIP PIPES for above, with 50 feet of 8-inch Foul Main and Connections complete.

One 8-inch Donkin's VALVES.

For further Particulars, apply to G. M. ROBINS, Gas Offices, Sutton, SURREY.

DEVONPORT GAS-WORKS.
CONTRACT No. 6.

GASHOLDER TANK.

THE Corporation of Devonport are prepared to receive TENDERS for the construction of a GASHOLDER TANK at their Works.

Copies of the Specification and Drawings can be seen, on and after Wednesday, the 29th of July, 1903, at the Manager's Office, Gas-Works, Devonport, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster.

Copies of the Tender and Bill of Quantities can be obtained from the above-mentioned on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, in accordance with the instructions at the head of the Tender, are to be delivered to the undersigned not later than Saturday, the 29th day of August, 1903.

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

DEVONPORT GAS-WORKS.
CONTRACT No. 8.

THE Corporation of Devonport are prepared to receive TENDERS for the supplying and laying of CAST-IRON MAIN PIPES, VALVES, and APPENDAGES at their Works.

Copies of the Drawings can be seen on and after Wednesday, the 5th of August, 1903, at the Gas-Works Offices, Devonport, or at the Office of the Engineers, Messrs. Stevenson and Burstal, 38, Parliament Street, Westminster.

Copies of the Specification, with Tender and Schedule of Quantities attached, can be obtained from the above-mentioned on payment of One Guinea, which will be returned on receipt of a *bonâ-fide* Tender.

The Corporation do not bind themselves to accept the lowest or any Tender.

Sealed Tenders, in accordance with the Instructions at the head of the Tender, are to be delivered to the Town Clerk, Devonport, not later than Saturday, the 29th of August, 1903.

(Signed) SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

DEVONPORT GAS-WORKS.

OXIDE OF IRON.

THE Corporation of Devonport are prepared to receive TENDERS for the supply of 250 Tons of IRISH BOG ORE for Gas Purification.

Copies of Specification and Form of Tender can be obtained on application to the undersigned.

The Corporation do not bind themselves to accept the lowest or any Tender.

Sealed Tenders are to be sent in to the Town Clerk, Devonport, not later than the 29th of August, 1903.

SIDNEY E. STEVENSON,
Engineer and Manager.

Gas-Works, Devonport.

COUNTY BOROUGH OF SALFORD.
(GAS DEPARTMENT.)

THE Gas Committee are prepared to receive TENDERS for the supply of 700 Tons of OXIDE OF IRON Purifying Material.

Full Particulars may be obtained on application to Mr. William W. Woodward, Engineer, Gas-Works, Bloom Street, Salford.

Sealed Tenders, endorsed "Tender for Oxide," addressed to the Chairman of the Gas Committee, Town Hall, Salford, to be delivered to me not later than Three p.m. on Thursday, the 20th of August, 1903.

The Committee do not bind themselves to accept the lowest or any Tender.

L. C. EVANS,
Town Clerk.

Town Hall, Salford,
Aug. 5, 1903.

BOROUGH OF LEIGH.

(Gas and Water Departments.)

THE Gas and Water Committee of the above Corporation invite TENDERS for the LAYING of a 16-inch WATER-MAIN.

The Drawings may be seen and Form of Tender and Specification may be obtained, from Mr. James Gibson, Gas and Water Engineer, Leigh, Lancs.

Sealed and endorsed Tenders must be delivered to the undersigned on or before Twelve o'clock noon, on Saturday, the 22nd day of August, 1903.

The Corporation do not bind themselves to accept the lowest or any Tender.

By order,
Peregrine Thomas,
Town Clerk.

Town Hall, Leigh, Lancs.,
Aug. 7, 1903.

THE Directors of the Keswick Gas Company invite TENDERS for the supply of 1400 Tons of best screened GAS COAL or NUTS, to be delivered at Keswick Railway Station, between the 1st of September, 1903, and the 1st of July, 1904, in such quantities and at such times as may be required.

Tenders, stating Price per Ton in Contractors' own Waggons, and in the Company's Waggons, and endorsed "Tender for Coal," to be sent to the undersigned not later than the 25th inst.

No Form of Tender supplied.

The Directors do not bind themselves to accept the lowest or any Tender.

J. H. Brodie,
Secretary.

Main Street, Keswick,
Aug. 7, 1903.

CITY OF BIRMINGHAM.

THE Gas Committee of the City of Birmingham invite TENDERS for the purchase of the Surplus TAR to be produced at their Saltley, Nechells, Windsor Street, and Swan Village Works during the Five, Seven, or Ten Years commencing the 1st day of July, 1904.

Forms of Tender may be obtained from the undersigned on payment of One Guinea (which sum will be returned on receipt of a *bond-fide* Tender), and Tenders must be delivered to me not later than the 30th day of September next ensuing.

G. Hampton Barber,
Secretary.

City Gas Offices: Council House,
Birmingham, Aug. 5, 1903.

TO WATER-GAS PLANT ENGINEERS.

THE Town Council of Abergavenny invite TENDERS for providing and erecting at the Abergavenny Gas-Works, a CARBURETTED WATER-GAS PLANT, capable of producing 200,000 cubic feet of Carburetted Water Gas per day of Twenty-four hours.

Persons tendering are to supply complete Specifications, with Plans or Drawings of the Plant which they propose to erect. The Specifications and Plans will be returned to unsuccessful competitors.

Payment will be made by six equal annual instalments, with interest on the balance outstanding at Four per cent. per annum.

A Ground Plan of the Site for the Plant may be seen, and further Particulars obtained, on application to the Manager, at the Gas-Works, Abergavenny.

Tenders, with Specification and Plans, to be delivered to the Town Clerk, Town Hall, Abergavenny, not later than Wednesday, the 26th of August, 1903.

The lowest or any Tender not necessarily accepted.

J. T. Rutherford,
Town Clerk.

Aug. 4, 1903.

EDINBURGH AND LEITH CORPORATIONS' GAS COMMISSIONERS.

THE Commissioners are prepared to receive QUOTATIONS for the immediate supply of about 350/500 Tons of OXIDE OF IRON suitable for Gas-Works purposes, delivery *ex*-Ship into Commissioners' Waggons at the Granton Harbour free of all charges, or in Railway Company's Waggons, delivered to the Gas-Works Sidings, Granton, North British or Caledonian Railways.

The Contractor will be required to furnish the Engineer with the fullest Information as regards the Material to be supplied, such as the source of its production, as well as the percentage of moisture and effective Ferric-Hydrate in the mass.

The Material is to be delivered at the Granton Works before the 30th of September, 1903.

Further Information may be obtained upon application to Mr. W. R. Herring, Chief Engineer and Manager, Gas-Works, New Street, Edinburgh.

Tenders to be lodged with the undersigned on or before Ten a.m. on Saturday, the 15th of August, 1903.

The Commissioners do not bind themselves to accept the lowest or any Offer.

(Signed) James M'G. Jack,
Clerk.

25, Waterloo Place, Edinburgh,
July 27, 1903.

TOTTENHAM AND EDMONTON GASLIGHT AND COKE COMPANY.

NOTICE is Hereby Given, that the ANNUAL ORDINARY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Chief Offices, 639, High Road, Tottenham, on Saturday, the 22nd day of August next, at 2.30 o'clock in the afternoon precisely, to receive the Report of the Directors and Statement of Accounts for the Half Year ended the 30th of June, 1903, to declare a Dividend for the same period, to elect two Directors and an Auditor for the ensuing year, and for the transaction of General Business.

The TRANSFER BOOKS WILL BE CLOSED for the CONSOLIDATED STOCKS from the 8th to the 24th day of August, both days inclusive.

By order of the Board,
James Randall,
Secretary.

639, High Road, Tottenham,
July 31, 1903.

STRATFORD-ON-AVON CORPORATION.

(Gas Department.)

THE Gas Committee invite Tenders for the supply of 5000 Tons of GAS COALS, to meet their requirements during the ensuing Twelve Months, ending Sept. 30, 1904.

Forms of Tender will be supplied and full Particulars given upon application to

J. S. Cranmer,
Manager.

August, 1903.

MITCHAM AND WIMBLEDON DISTRICT GASLIGHT COMPANY.

(Incorporated by Act of Parliament, 1867.)

NOTICE is Hereby Given, that the SEVENTY-THIRD ORDINARY HALF-YEARLY GENERAL MEETING of the Shareholders of this Company will be held in the Board-Room, at the Works, Mitcham, in the County of Surrey, on Tuesday, the 25th day of August, 1903, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and a Statement of the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and for General Business.

The TRANSFER BOOKS WILL BE CLOSED from the 10th inst. until after the Meeting.

By order,
Benjamin Green,
Secretary and Manager.

Offices and Works: Western Road,
Mitcham, August, 1903.

NORTH MIDDLESEX GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, E.C., on Wednesday, the 26th day of August inst., at Twelve o'clock Noon, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1903, to declare Dividends, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 13th to the 26th of August inst., both days inclusive.

By order,
Ernest L. Burton,
Secretary.

Secretary's Offices: 5, Great Winchester Street,
Old Broad Street, London, E.C., Aug. 7, 1903.

COLNEY HATCH GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of this Company will be held at the Company's Offices, No. 5, Great Winchester Street, Old Broad Street, London, E.C., on Thursday, the 27th day of August inst., at 3.45 o'clock p.m. precisely, to receive the Report of the Directors and the Accounts of the Company for the Half Year ended the 30th of June, 1903, to declare Dividends, and for other purposes.

The TRANSFER BOOKS of the Company WILL BE CLOSED from the 14th to the 27th of August inst., both days inclusive.

By order,
Ernest L. Burton,
Secretary.

Secretary's Offices: 5, Great Winchester Street,
Old Broad Street, London, E.C., Aug. 7, 1903.

BARNET DISTRICT GAS AND WATER COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY GENERAL MEETING of the Proprietors of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 28th day of August, 1903, at Half-past Twelve o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 15th to the 28th of August, both inclusive.

By order of the Board,
Ernest W. Drew,
Secretary.

Offices: 30, Gracechurch Street,
London, July 31, 1903.

RIDDINGS DISTRICT GAS COMPANY.

NOTICE is Hereby Given, that the ORDINARY HALF-YEARLY MEETING of the Shareholders of the above Company will be held at the Albion Tavern, Aldersgate Street, in the City of London, on Friday, the 28th day of August, 1903, at Three o'clock in the Afternoon precisely, to receive the Report of the Directors and the Accounts for the Half Year ended the 30th day of June last, to declare a Dividend, and to transact the General Business of the Company.

The TRANSFER BOOKS WILL BE CLOSED from the 15th to the 28th of August, both inclusive.

By order of the Board,
Ernest W. Drew,
Secretary.

Offices: 30, Gracechurch Street,
London, July 31, 1903.

ISSUES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his ISSUES by AUCTION under PARLIAMENTARY POWERS of STOCKS and SHARES in LONDON, SUBURBAN, and PROVINCIAL GAS and WATER COMPANIES take place PERIODICALLY at the Mart, TOKENHOUSE YARD, E.C.

Terms for Issuing such Capital, and also for including Gas and Water Stocks and Shares belonging to Private Owners in these Periodical Sales, can be obtained on application at Mr. Alfred Richards' Offices, 18, Finsbury Circus, E.C.

BOROUGH OF PORTSMOUTH WATER-WORKS COMPANY.

WATER ORDER, 1902.

THE Directors of the above Company Hereby give Notice, that a SALE by AUCTION of TWO THOUSAND NEW ORDINARY £5 SHARES in the above Company will, under and in pursuance of, the Borough of Portsmouth Water Order, 1902, be held at the Lower Albert Hall, Commercial Road, Portsmouth, by

Messrs. LOVE & COOPER, Auctioneers,

on Wednesday, the 30th day of September, 1903, at Seven o'clock in the Evening.

The above Shares, which form part of the New Ordinary Capital authorized to be raised by the said Order, will be sold in Lots, of which the Amounts and Particulars (together with the Conditions of Sale) will be duly announced.

Dated this 30th day of July, 1903.

By order of the Board of Directors,
J. L. Wilkinson,
Secretary to the Company.

Company's Offices: Commercial Road,
Portsmouth.

NEWCASTLE-UPON-TYNE AND GATESHEAD GAS COMPANY

SALE BY TENDER OF £35,000 THREE-AND-A-HALF PER CENT. DEBENTURE STOCK.

Minimum Price, £100 Per Cent.

NOTICE is Hereby Given, that the Directors will SELL BY TENDER £35,000 of THREE-AND-A-HALF PER CENT. DEBENTURE STOCK, to be issued under the Provisions of the Newcastle-upon-Tyne and Gateshead Gas Act, 1901.

Particulars and Forms of Tender may be obtained on application to the undersigned; and Tenders must be sent in so as to be received at the Office of the Company not later than Ten a.m. on Tuesday, the 25th of August, 1903.

The Stock will be allotted to the highest Tenderers; but no Tender will be accepted at a lower price than par.

By order,
Thomas Waddom,
Secretary.

Offices: 35, Grainger Street West,
Newcastle-upon-Tyne, Aug. 5, 1903.

THOMAS DUXBURY & CO.,
16, DEANSGATE, MANCHESTER.

Best Gas Coal and Cannel, giving High Illuminating Power, Large Yield per ton, and reasonable in Price.

Telegrams DARWINIAN, MANCHESTER."
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PETROLEUM GAS SYNDICATE

Supply and erect Complete Installations of their

PETROGENE PATENT GAS PLANT
On SALE, HIRE, or ROYALTY.

PETROGENE GAS is the most suitable Illuminant for all Towns, Villages, Factories, Institutions, &c., where a Cheap and Efficient Lighting System is required. It is equally suitable for Heating and Power purposes, and may be used with ordinary Gas Fittings, Stoves, Engines, &c. It may also be used in conjunction with Coal Gas, and affords Gas Companies a ready means of increasing their output without the expense of additional storage.

The Syndicate is prepared to entertain offers of sale of small Gas-Works, whether profit earning or not.

Offices: 28, Victoria St., Westminster.
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HEATHCOTE GAS COAL.

Rich in Illuminating Power and Yield of Gas.

Above the Average in Weight and Quality of Coke.

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Special Lumps, Tiles, and Bricks for Regenerative and Furnace Work.

SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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Highest Results in Gas, & Excellent Coke.

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JAMES OAKES & CO.,

ALFRETON IRON-WORKS, DERBYSHIRE,

AND

Wenlock Iron Wharf, 21 & 22, Wharf Road, CITY ROAD, LONDON, N.,

Manufacture and keep in Stock at their Works (also large stock in London)

PIPES and CONNECTIONS, 1½ to 48 inches in diameter, and make and erect to order RETORTS, PURIFIERS, and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas, Water, Railway, Telegraph, Chemical, Colliery, and other Companies.

NOTE.—Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with Bolts, Nuts, and Covers, and rendering Leakage impossible.

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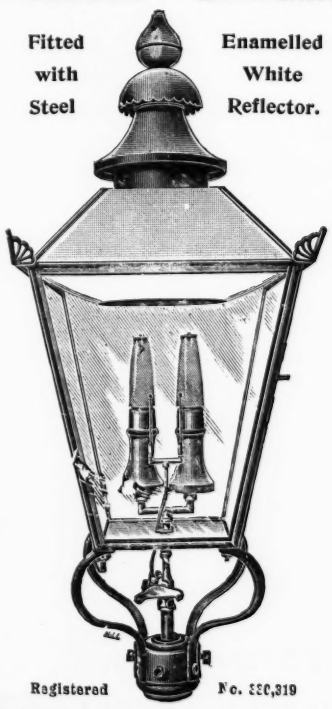
"KILBURN" LANTERN.

Fitted with Steel

Enamelled White Reflector.



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Gas Companies are solicited to try Samples of the

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MIRFIELD (GAS-COAL) COLLIERY COMPY

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Save you considerable trouble, and

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For use in the

RECOVERY OF SULPHUR,

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in catch position.

Full Particulars on application to the Patentees:

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With Elevators and Conveyors worked by Steam or Gas Engine.

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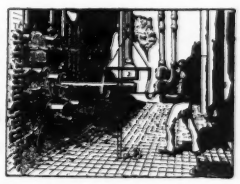
CHARGING APPARATUS

Nearly **40** of these Machines have been



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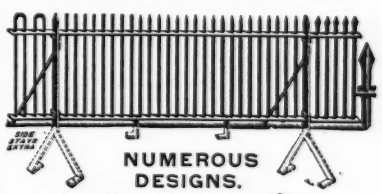

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NOTICE OF REMOVAL.

R. & A. MAIN, LIMITED,

Coal, Steam, and Gas Cooking and Heating Engineers,

214 ST. JOHN STREET, CLERKENWELL,

London, E.C.

July, 1903.

Dear Sir,

We have pleasure in informing you that we have taken new Offices in the City, and that on and after the 27th inst. our address will be

49, QUEEN VICTORIA STREET, LONDON, E.C. (opposite Mansion House Stn.),

where all orders, letters, and communications are to be addressed. As heretofore all goods, battens, and boxes should be sent to our works at Edmonton, and addressed R. & A. MAIN, Ltd., Gothic Works, Angel Road Station, G.E.R., London.

Thanking you for past favours, and trusting to receive a continuance of same, which shall always have our best attention,

We are,

Yours faithfully,

R. & A. MAIN, LTD.

P.S. Our new Telephone Number will be 6159 Bank.

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Illuminating Power 80 to 700 Candles.

EXPORT MANTLES, 27/- PER GROSS.
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Special Quotation for Large Quantities.

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Special low Quotations with their own Labels and Stamps.
Burners of all descriptions, solid Brass, from **1/9** per dozen.

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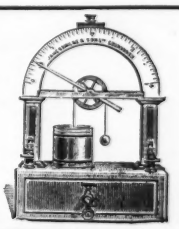

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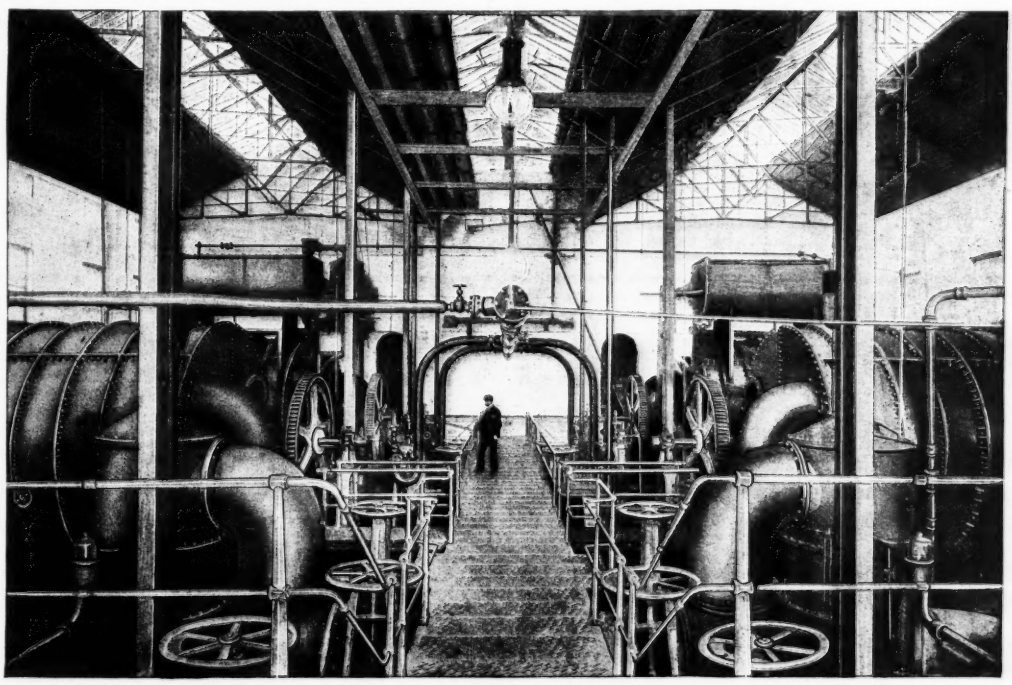

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Specialities:

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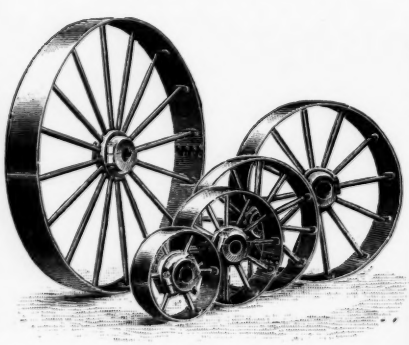

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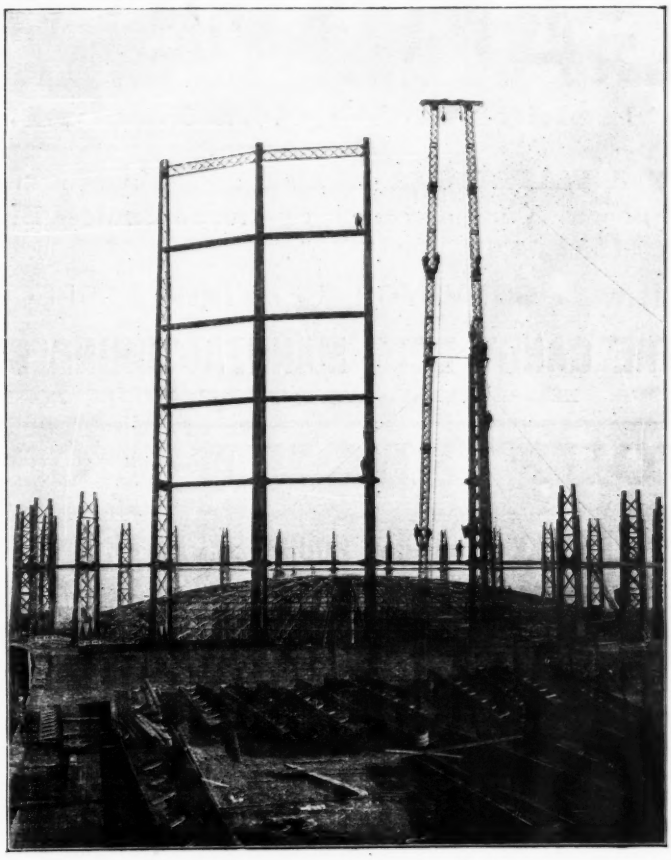

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VERY FREE FROM IMPURITIES.

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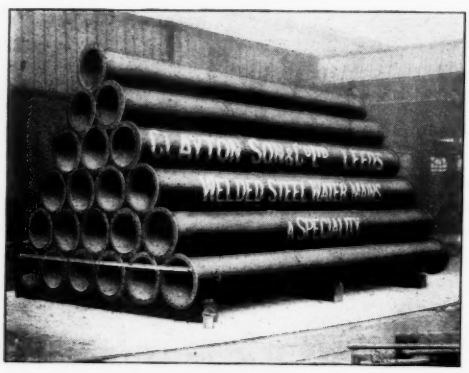

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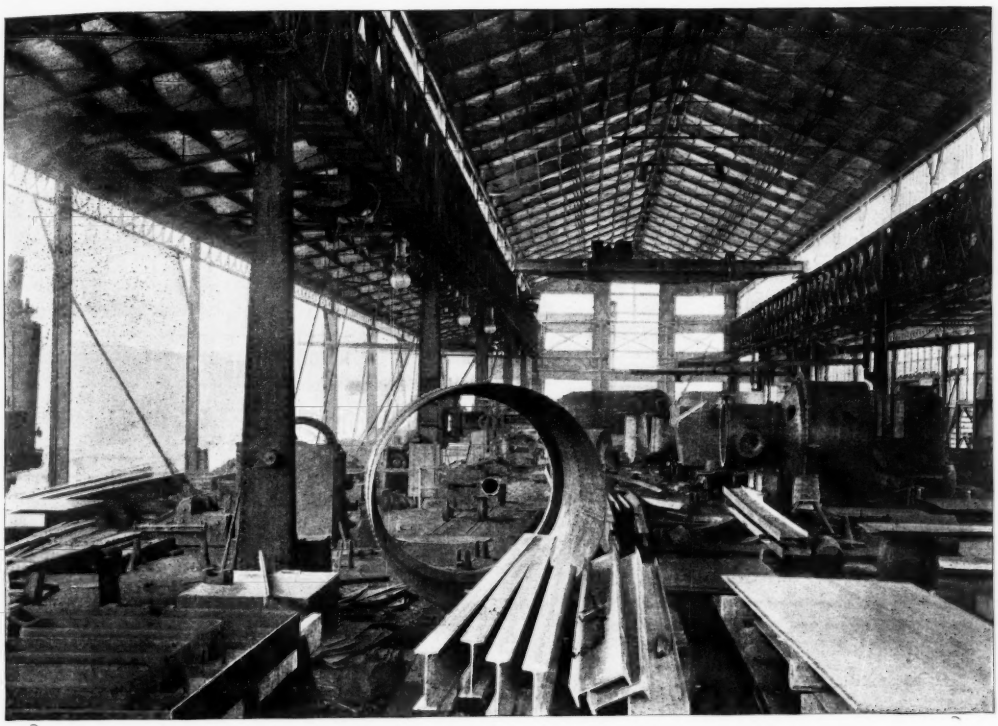

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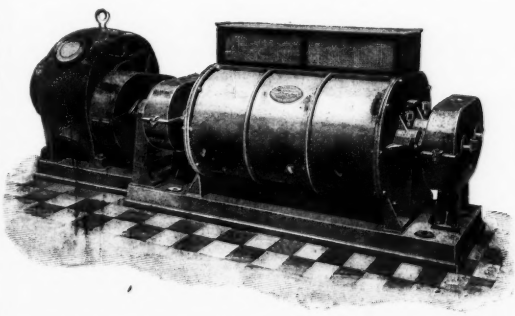

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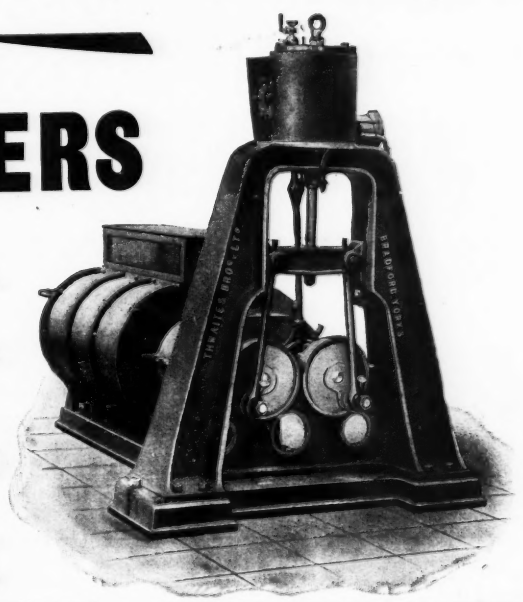

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IN ALL SIZES TO DELIVER UP TO

25,000 cubic feet of Air per minute.

Driven by Engine, Belt, or Motor.

SPECIALLY DESIGNED AND OF

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But having made contracts in advance, we are selling our well-known

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Contracts for the Season at Special Rates.

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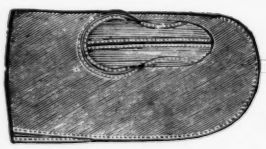

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STOKERS' MITTS.
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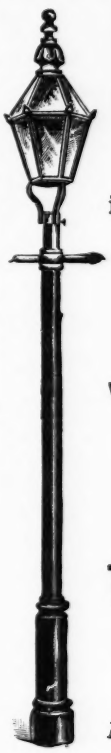

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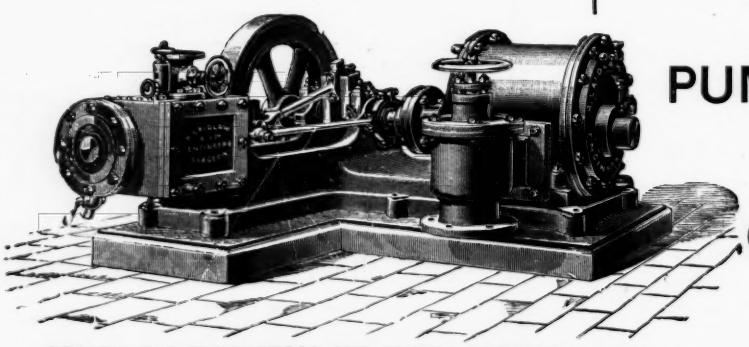

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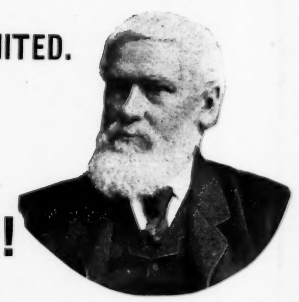

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